AUGUST, 1928

Railway Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE
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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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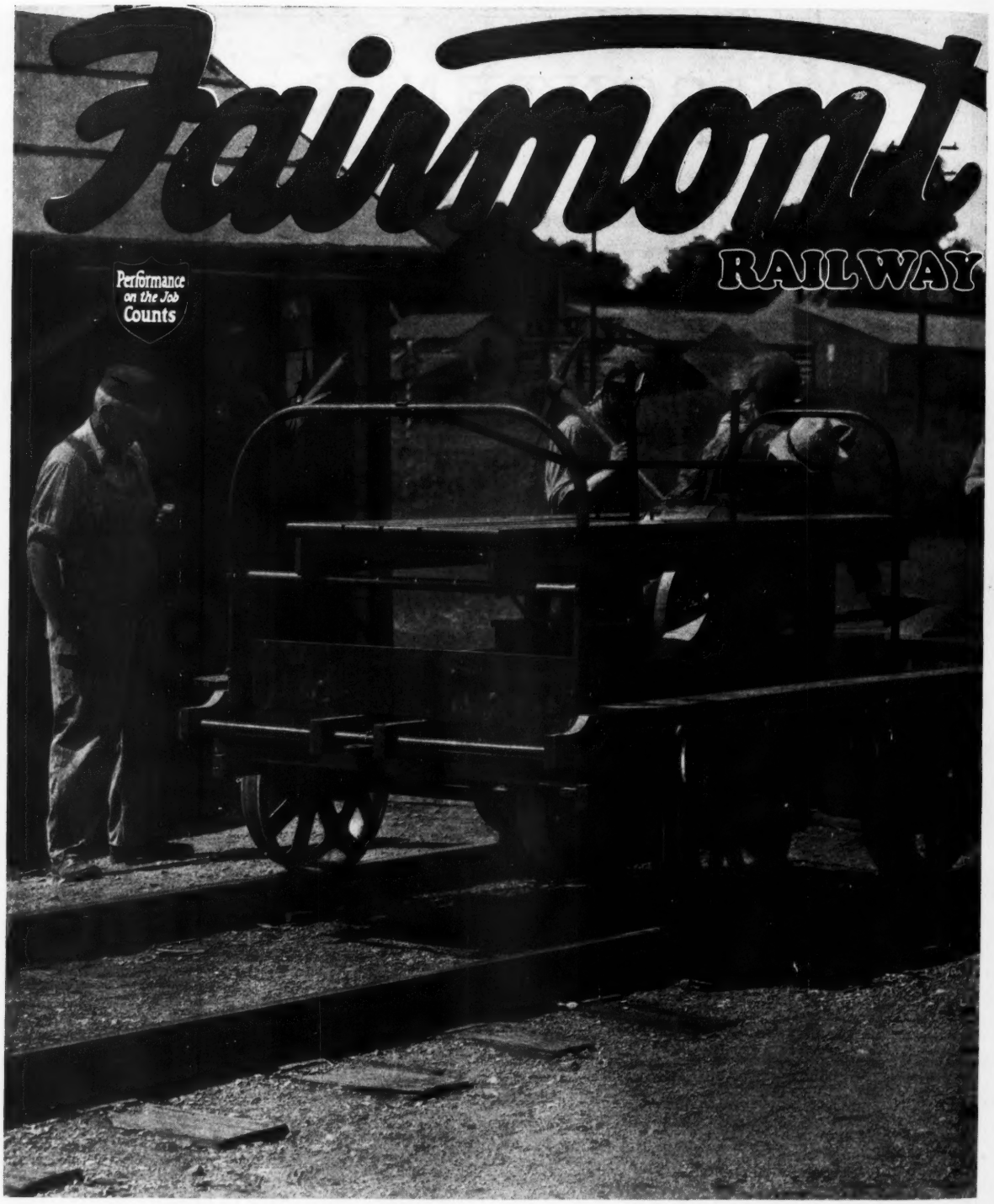

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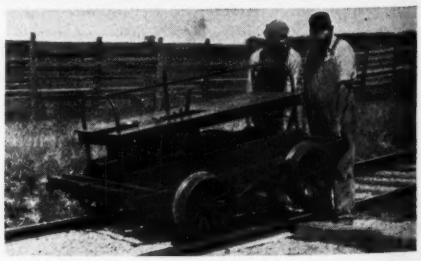
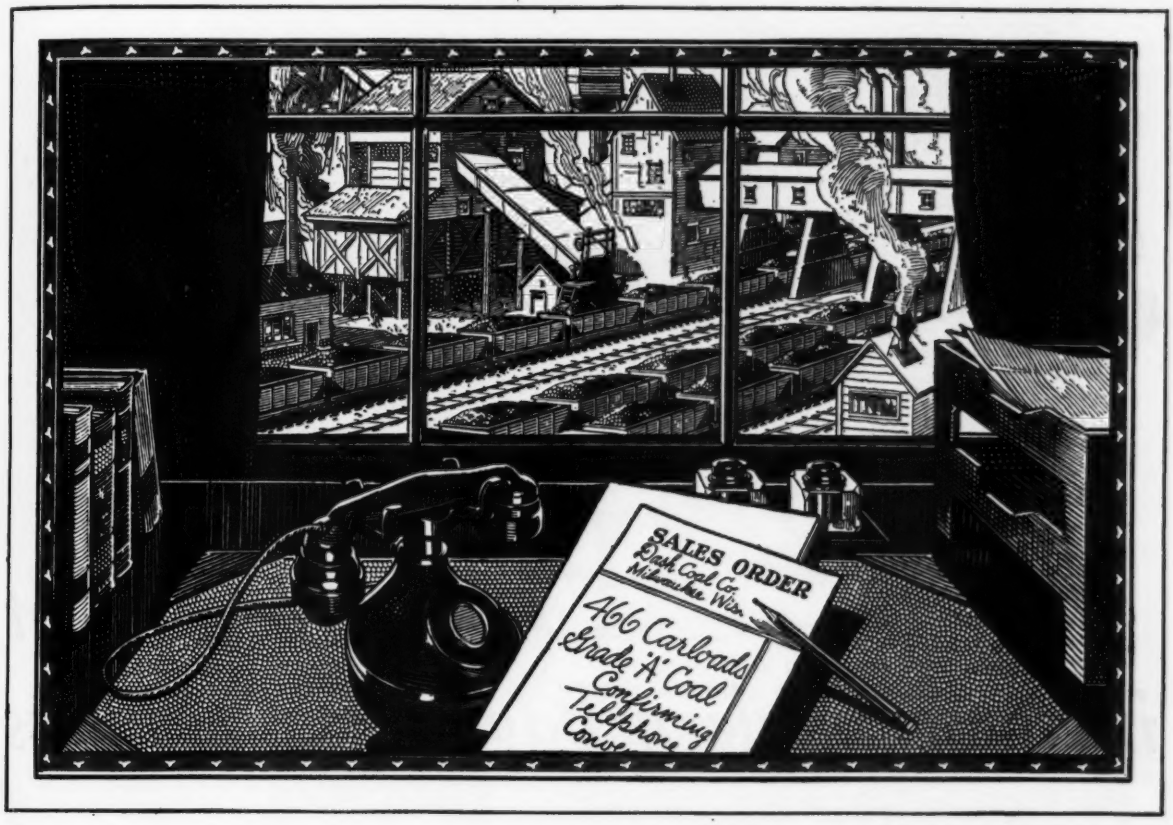


THE RAILROAD

Competitors on their way. He Telephoned ahead and sold 466 carloads of Coal



An Advertisement for Bell Long Distance Telephone Service

THE sales manager of a West Virginia coal company received word that two Milwaukee firms were in the market for a large tonnage. It was too late for him to send a representative, as competitors were already on their way. He used his telephone immediately. He made five long distance calls at a cost of $22.90. He got the order for 466 carloads of coal.

A Texas oil buyer had an option on a million gallons of gasoline. The option expired at noon. At 10:30 an increase in price was made public. Action was imperative, but he had to get the approval of his vice-president who was in Philadelphia. In 15 minutes he had the vice-president by Long Distance, secured the authority to buy and closed the deal. Saving, $10,000. A Minneapolis fruit company was left with 8 carloads of peaches more than they could dispose of through their regular channels. Their long distance salesmen, by 12 telephone calls at an average cost of $3.12 a call, sold the 8 carloads. Total sales, $9009.

What long distance calls could you profitably make today? It is surprising how little they now cost. New station to station day rates are: Chicago to Berlin, $53.25. New Orleans to Chicago, $3.50. Miami to Atlanta, $2.80. Pittsburgh to Boston, $2.20. Washington to Philadelphia, 85c. . . . . Calling by number takes less time. . . . . *Number, please?*

Buy your cement in these modern bags to avoid loss

THE BEST form of cement insurance is buying your material in Bates Multi-Wall Paper Bags, the modern containers which resist moisture and rough handling with 5 separate walls of tough, pliable paper.

Bates Bags not only protect your cement against sudden showers, warehouse moisture and loss through bag breakage or sifting; they eliminate much clerical work because they need not be returned for credit.

Buy in Bates Multi-Wall Paper Bags and put your cement stocks on a no-loss basis.

—no loss

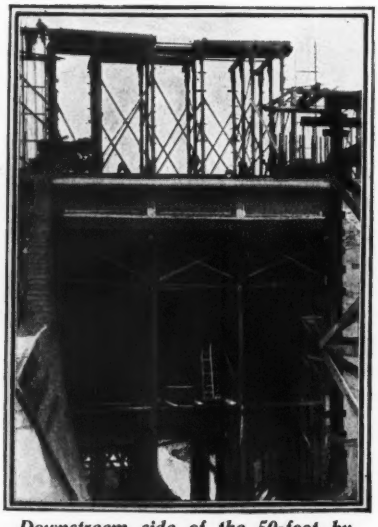
BATES VALVE BAG CORPORATION
35 E. Wacker Drive, Chicago, Ill.

BATES Multi-Wall PAPER BAGS

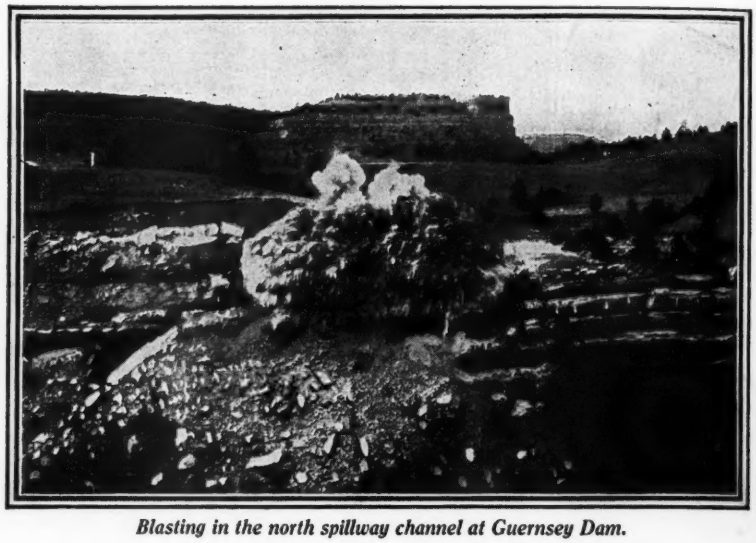
Bates Multi-Wall Paper Bags are made by the Bates Valve Bag Corporation in 8 modern plants throughout the country

Desert

The New Guernsey Dam Completes



Downstream side of the 50-foot by 50-foot Stoney gate installed in the north spillway.



Blasting in the north spillway channel at Guernsey Dam.

IN the summer of 1927 the last step was completed in the gigantic enterprise of the U. S. Bureau of Reclamation, "The North Platte Irrigation Project." The Guernsey Dam and Power Plant, with the assistance of two other great dams, and a network of canals, now irrigates more than 237,000 acres of what was less than twenty years ago nothing but arid desert. Two railroads carry to eastern markets trainloads of cattle, sheep, grain, potatoes, oats, corn, wheat, barley and sugar—all grown on once-desert land within one decade made fertile by the waters of the North Platte.

The first step was the construction, in 1910, of the Pathfinder Dam in south-central Wyoming, the highest rock masonry dam in the world—218 feet above its rock foundation. The resulting reservoir has a storage capacity of 1,070,000 acre-feet and covers 22,700 acres.

The Fort Laramie Diversion Dam, 175 miles further down the North Platte, was the second step. It controls the flow of the water released from the Pathfinder Dam into the Interstate Canal on the north side of the river and the Fort Laramie Canal on the south side. These canals extend 100 miles along each side of the river and supply water to the broad area of land between—more than 237,000 acres.

One more step was still necessary to satisfactorily control the river waters. A supplemental water storage must be created to conserve the inflow below the Pathfinder Dam. Electrical power was needed for the scores of towns ranging in population from a few hundred to five thousand and more.

The Guernsey Dam and Power Plant

In addition to constructing the dam proper, four tunnels had to be driven, one diversion tunnel to serve as a temporary by-pass for river water during the dam construction, two spillways, and a power penstock.

The first tunnel for the temporary by-pass of water during dam construction was driven through the solid

Showing placement of concrete made with Quikard Cement on Santa Fe R. R. crossing, Chadbourne Street, San Angelo, Texas.

Ready for Service 24 Hours After Paving!

IT was out of the question to close to traffic for any length of time the busy Santa Fe R. R. crossing at San Angelo, Texas. To meet the emergency, concrete made with Quikard Cement was used. Within 24 hours after the last batch was placed, heavy city and train traffic was resumed!

Quikard is a true Portland Cement that produces in 24 hours concrete as strong as Portland Cement specifications require in 28 days—with increased strength thereafter. It not only fulfills U. S. Govt. and A. S. T. M. standard specifications for Portland Cement, but exceeds all strength requirements. It requires no admixtures or accelerators and is mixed in standard proportions.

Quikard Cement is *not* quick-setting, but takes its initial and final set normally—allowing plenty of time for proper mixing, placing and finishing. It is plastic, easy to finish, dependably uniform. It produces an exceptionally water-proof concrete that forms a perfect bond with new or old Portland Cement concrete. Quikard Cement is a *proven* product affording maximum speed with absolute safety! It will save *you* time, labor and money.

Produced Only by
ASH GROVE LIME & PORTLAND CEMENT CO.
Founded in 1882
604 Grand Avenue Temple, KANSAS CITY, MO.

QUIKARD CEMENT

Write for Complete Information

Send for illustrated literature giving full information about Quikard Cement. Demonstrates its use on important jobs. Write today!

4

A Syntron Tie Tamper does the work of 4 men—and cuts tie-tamping costs

A Syntron Tie Tamping Outfit weighs about one-fourth as much as an air outfit. It can be easily moved about by five or six men. Dolly wheels on the bottom of the Power Unit allow it to ride on the rail.

PUT a Syntron Outfit to work on your lines and watch the bottom fall out of track surfacing costs. The Syntron is at work on the leading roads cutting labor costs to a fraction, making a smoother, longer lasting track, saving time and avoiding trouble. A 4-tamper Outfit will do the work of twelve to sixteen men with tamping picks and will make a better job all the way through. The whole equipment is very simple. No air hose, pipe lines, valves or other fittings to contend with. The Syntron Tamper itself has but one moving part, no motors, gears or eccentrics —nothing to get out of order.

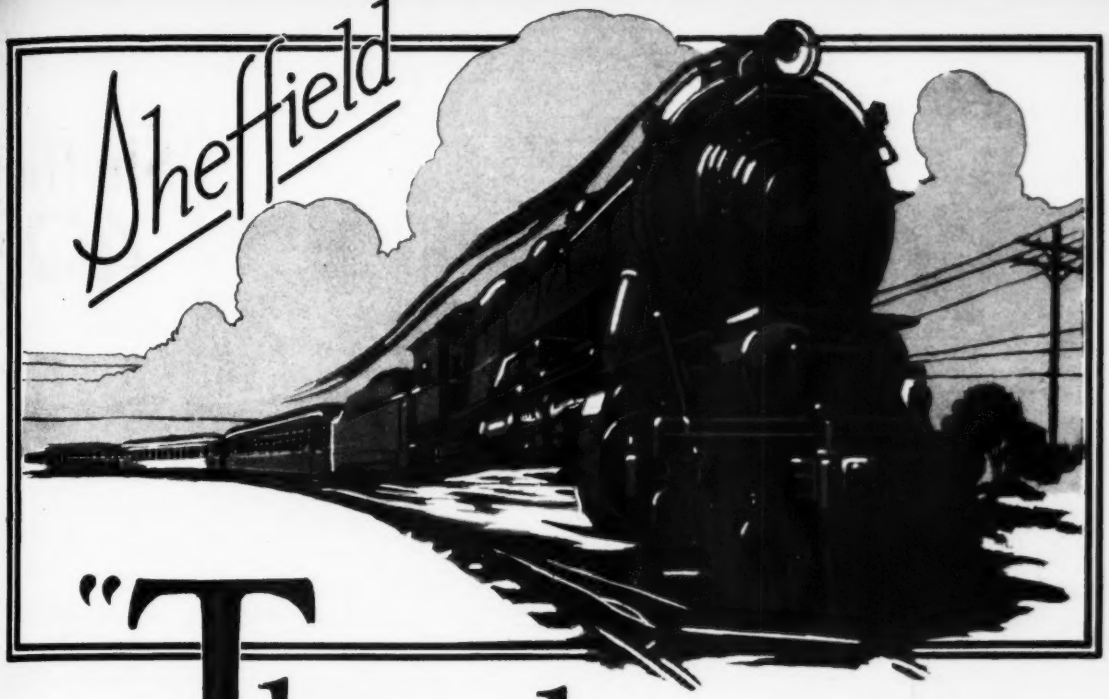
Now is the time to get started on the cost-cutting program. Investigate how much a Syntron tie-tamping outfit can do for you in cutting tamping costs and by operating a large number of portable electric tools. Write for complete information, sent on request.

The Syntron Electric Tie Tamper is a marvel for mechanical efficiency. It tamps ballast at the rate of 1500 powerful speedy blows a minute.

SYNTRON COMPANY
Pittsburgh, Pa.

SYNTRON

Electric Power Units and Tampers



"They also serve who only guard the way"

Trim . . . fleet . . . mighty! The "thoroughbred" of the rails "highballs" her way to destination. Her daily record of "on time" is the pride of her road and a testimony to the men and shops that keep her in shape for the run.

But the thoroughbred's safety and schedule are also in the hands of other men and equipment who guard the right-of way. Inspectors, signalmen, section crews, "maintenance of way" men travel on sturdy, dependable Sheffield cars. A failure in their transportation means less safeguard to the thoroughbreds who follow after. But into each Sheffield Motor Car has been built a stamina that enables it to meet the everyday and emergency needs of railroading without faltering.

Today Sheffield Cars serve on every important railroad in North America. Railroad men have found them fitting and indispensable aids in their task of guarding the way.

FAIRBANKS-MORSE

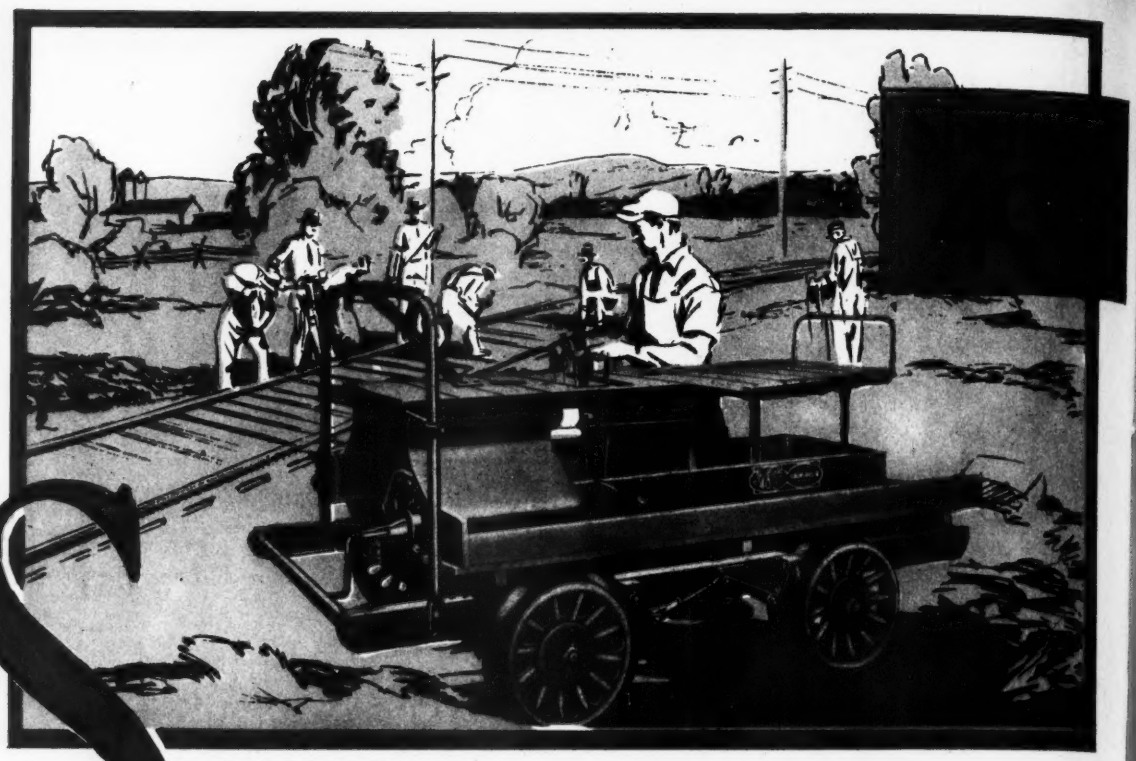
TIMKEN BEARING EQUIPPED

F M

MOTOR CARS

FAIRBANKS-MORSE *Motor Cars*

FAIRBANKS-MORSE *MOTOR CARS*



SUPER dependability, economy, performance.

The Sheffield "40-B"—foremost in everything a fine motor car should be—gives you this and *more*. Abundant power for hauling a big gang of men with their tools—and trailer, too. Exceptional torque at low speeds. Three-point suspension of engine. Simplified friction transmission. Timken tapered roller bearings on drop-forged crankshaft and also on axles. Strong pressed steel automobile-type frame. Positive force-feed lubrication. These and many other features of highly perfected design make this a motor car without peer.

FAIRBANKS, MORSE & CO., *Chicago*
Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; steam, power and centrifugal pumps; scales; complete coaling stations

FAIRBANKS-MORSE

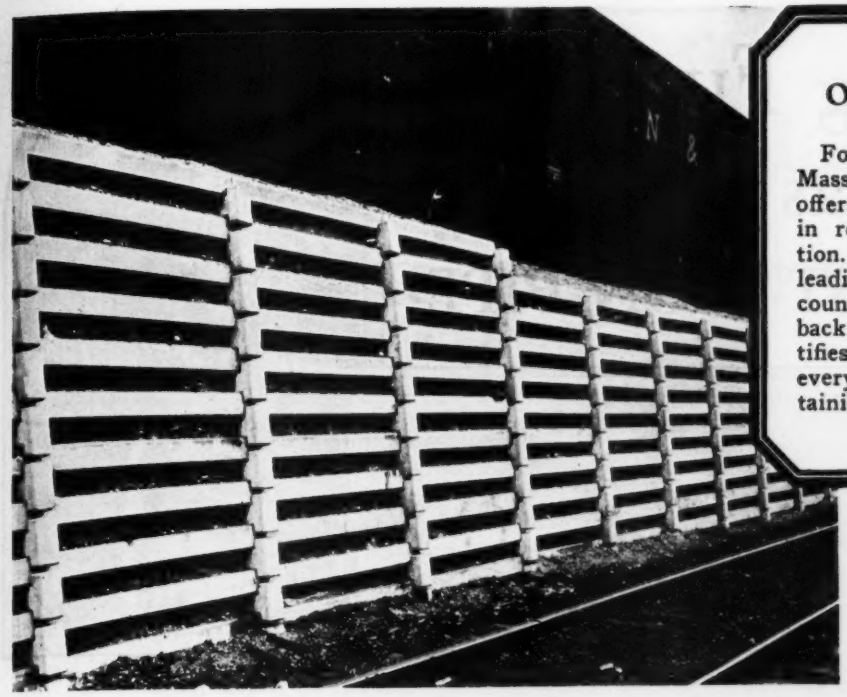
TIMKEN BEARING EQUIPPED

F M

MOTOR CARS

ARA21.42

First on the rails—and still first



Open Face Cribbing

For all ordinary locations Massey open face cribbing offers the maximum economy in retaining wall construction. It has been adopted by leading roads throughout the country. The service record back of Massey cribbing justifies its consideration on every project involving a retaining wall.

Factory-Made REINFORCED CONCRETE PRODUCTS

MASSEY

CONCRETE PRODUCTS CORPORATION

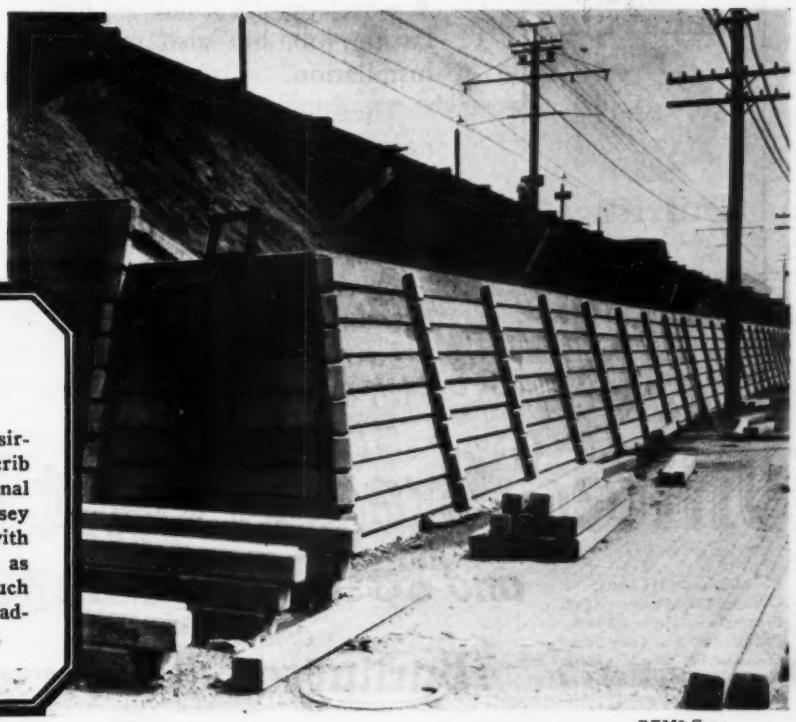
Peoples Gas Building, Chicago

Sales Offices: New York, Atlanta, Cincinnati, St. Louis, Los Angeles

Canadian Concrete Products Co., Limited, Transportation Building, Montreal, Que.

Other MASSEY Products

Culvert pipe
Cattle passes
Piling
Pedestrian passageways
Battery wells and boxes
Telephone booths
Poles

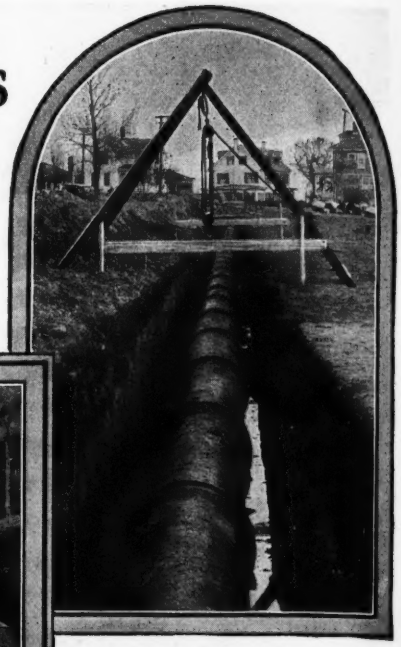


Closed Face Cribbing

For locations where it is desirable to provide a closed face crib wall and where the slight additional cost is justified, the standard Massey Type H design is applicable with special stretchers in the face as shown in the illustration. Such walls have the same structural advantages as the open face design.

REM8-Gray

Reducing FIRST costs as well as *last* costs with CAST IRON PIPE



{above}
An inexpensive crane for placing pipe in position

{at the left}
Unloading 24" cast iron pipe using skids

Much helpful data for the engineer and contractor is contained in the U. S. Cast Iron Pipe Hand book. May we send your copy now?

FIRST cost is usually the last cost with cast iron pipe... And proper handling methods will not only insure a lasting job, but also materially reduce the first cost of installation.

The illustration above shows the simple equipment necessary for handling efficiently medium-sized cast iron pipe. The use of the inexpensive crane illustrated speeds up the work, reduces labor cost and helps to make a better finished job.

Practical experience indicates that the use of labor-saving devices may save as much as 40% of the cost of laying mains with hand labor alone. Skillful handling and good equipment on the job always pay.

United States Cast Iron Pipe and Foundry Company

General Offices:
Burlington, New Jersey

Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 957 East Ferry Street
Cleveland: 1150 East 26th Street
New York: 71 Broadway

San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Minneapolis: 6th Street & Hennepin Avenue

Extending railroad facilities to new communities

A Necessary Ally of Tie Preservation

THE IMPROVED LUNDIE TIE PLATE

TIE preservation and Lundie Tie Plates are allied successfully in prolonging the life of ties in track—one preventing decay, the other preventing mechanical destruction.

Tie preservation remains effective only as long as moisture is entirely excluded from below the depth of penetration of the preservative. This can only be attained by the use of a tie plate, that does not cut or wedge into the wood fibre.

Numerous roads have Lundie Tie Plates in service 10 and 12 years under heavy traffic. Thorough inspection of these ties gives positive evidence that they are still in excellent condition with no cutting or mechanical wear and not the slightest indication of plate movement on the ties.

These money saving results are made possible because Lundie Tie Plates are demonstrating their ability to absolutely hold gauge with complete elimination of destructive cutting of wood fibres. They assure the maximum return on your investment in treated ties.

The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago

LUNDIE TIE PLATE

A Partial List of Railroads using UNIVERSAL PIPE

Chicago and Northwestern
Florida East Coast
New York, New Haven & Hartford
Chicago, Burlington and Quincy
Long Island
Louisville & Nashville
Delaware, Lackawanna & Western
Mobile & Ohio
Canadian Pacific Railway
Pennsylvania Lines
Boston & Albany
Boston & Maine
Central Vermont
Wheeling & Lake Erie
International Railways of Central America
Truxillo R. R. of Honduras
Tela R. R. of Honduras

Dependable water supply Savings all along the line

NOTHING here to deteriorate, nothing to blow out, nothing to work loose. These tight, flexible joints stay tight because the *joint* as well as the pipe is *all-cast-iron.*

No lead, lead-substitutes, nor any other jointing materials. No pouring, no calking, no bell holes to dig.

Tools? Just wrenches!

The contact surfaces of the hub and spigot ends are machined on a slight differential taper making a natural iron-to-iron joint that amply provides for expansion and contraction, vibration and uneven ground settlement.

Approved by the Underwriters Laboratories which are under the direction of the National Board of Fire Underwriters.

Valves and hydrants of the best known makes are obtainable with the Universal Pipe machined joint.

For water supply, fire protection and other service where freedom from leakage is essential. Easier! Quicker! Safer! *Address nearest office.*

UNIVERSAL CAST IRON PIPE

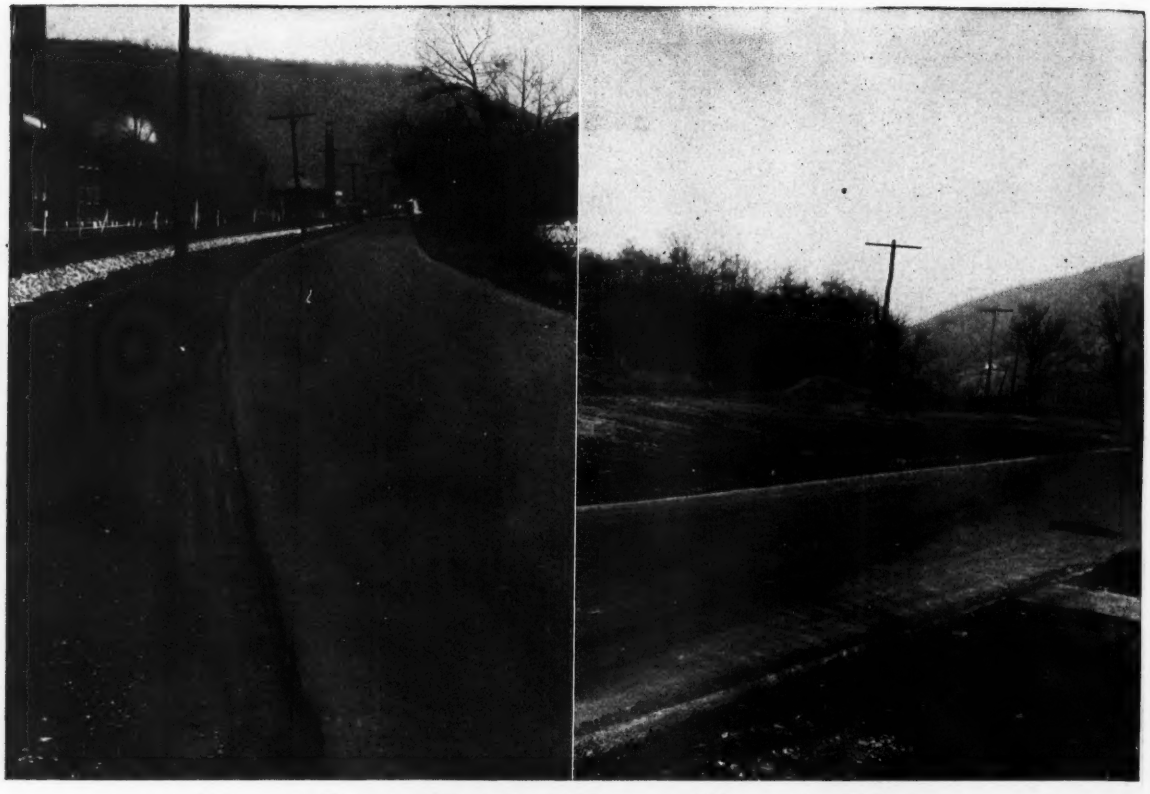
No bell holes to dig: No joints to calk

THE CENTRAL FOUNDRY COMPANY

Subsidiary of The Universal Pipe and Radiator Company

Graybar Building, 420 Lexington Avenue

Chicago Birmingham New York Dallas San Francisco



Kyrock Under Traffic 5 Years. Note the Edges

Latrobe-Kingston Road, Westmoreland County, Pa. Kyrock laid 1923. Photo 1928

A Kyrock Top Saves Concrete Roads

The Kyrock top protects the old base and prevents further disintegration. Surfacing with Kyrock may be done on half the road at a time without interruption to traffic. Kyrock is laid *cold*. It is resilient, non-reflecting, NON-SKID. On concrete it reduces vibration 75%. *Investigate Kyrock.*

This concrete highway, when five years old, was surfaced with Kyrock for a distance of one mile. The old concrete was paint-coated and Kyrock raked and rolled (1½ inch compacted) *flush with the edges of the concrete.* These two views show that the *unprotected* edges of the Kyrock surface stand up under the abuse of vehicles running on and off the pavement. Write today for Kyrock data.

KENTUCKY ROCK ASPHALT CO., *Incorporated*, LOUISVILLE, KENTUCKY

Kyrock

The Uniform Pavement

KENTUCKY ROCK Kyrock ASPHALT

What Do Fence Specifications Mean?

SPECIFICATIONS on fence all sound practically alike. They don't tell the story. They hit only the "high-spots" and leave plenty of loopholes to snare the unwary buyer.

For example, what do specifications tell you about strength and fit of fittings? Design of gates? Full-weight materials? How do you know you won't get light weight tubing instead of standard pipe for line posts? Inadequate concrete post foundations? A crooked top rail? A sloppy job of erecting?

You *don't* know from specifications. You can't always tell from samples of materials. But you are positive of a first class fence job — fresh, new full-weight materials, every detail right, the highest standards throughout — when Cyclone handles the job. Cyclone takes Complete Responsibility — never delegates work to local agents — stands squarely back of every installation.

Don't rely on specifications alone. Near you there is a Cyclone representative. Call him in and learn why you should award Cyclone your fence job. Cyclone prices are right, the fence is right, the erection work is right. A quality proposition throughout.

Cyclone Fence

REG. U.S. PAT. OFF.

Fencing for residences, estates, playgrounds,

The Mark of Dependable

schools, factories, property of all kinds.

Property Protection

CYCLONE FENCE COMPANY

Main Offices: WAUKEGAN, ILL.

Works and Offices: North Chicago, Ill., Greensburg, Ind., Cleveland, Ohio, Newark, N. J., Fort Worth, Texas, Oakland, Calif., Portland, Ore.

Direct Factory Branches: Atlanta, Baltimore, Buffalo, Charlotte, Cincinnati, Des Moines, Detroit, Hartford, Conn., Houston, Indianapolis, Jacksonville, Fla., Kansas City, Mo., Milwaukee, Mineola, N.Y., Minneapolis, Mount Vernon, N. Y., Philadelphia, Pittsburgh, St. Louis, Syracuse, Toledo, Tulsa. *Pacific Coast Division:* Standard Fence Company, Oakland, Los Angeles, and San Francisco, Calif., Northwest Fence & Wire Works, Portland, Oregon and Seattle, Washington.

"--certainly does make a beautiful curve"

Note the Y-shaped headers which interlock with the stretchers, holding the backfill without the use of a third member in the bank. This results in a cellular wall of great strength and with no plane of cleavage.

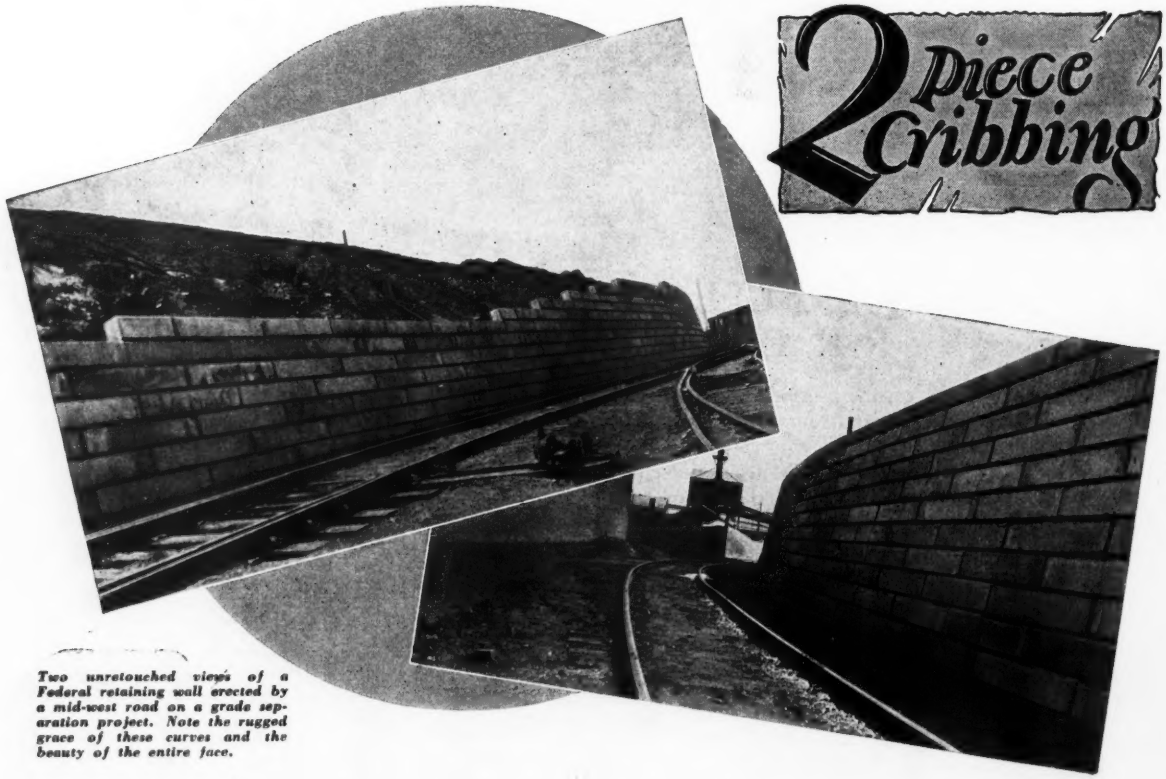
The clean-cut face of a Federal wall, as smooth and regular as fine masonry, distinguishes it at once from every other form of cribbing construction.

This architectural beauty is no less evident on curves. Because of the flexibility of Federal design, perfect curves up to 20 degrees can be constructed from standard stock units without any sacrifice of ruggedness or stability.

This sturdy, attractive wall represents the furthest advance in present day cribbing construction. The unique, 2-piece design not only saves money in material and erection costs, but eliminates maintenance as well. There are no open spaces in the face of the wall for backfill to filter through or vegetation to take growth.

Federal is in service on many of the most progressive lines in the country. One road has just contracted for its sixth Federal wall. Booklet and engineering data on request.

FEDERAL CEMENT TILE COMPANY
608 S. Dearborn Street, Chicago
Concrete Products for 25 Years



Two unretouched views of a Federal retaining wall erected by a mid-west road on a grade separation project. Note the rugged grace of these curves and the beauty of the entire face.

FEDERAL CONCRETE CRIBBING

The New CP Tie Tamper

Faster – Lighter Easier to Handle

TIE tamping has been simplified, speeded up and reduced in cost by the new CP Tie Tamper. SIMPLIFIED because the operator stands in an easy, natural position and complete control is under the palm of one hand. SPEEDED UP because the CP Tie Tamper is faster, lighter and easier to handle. REDUCED IN COST because the operator can do more work with less fatigue than with any other tool as the hammer is fully cushioned on both ends and practically vibrationless; an Automatic Throttle Valve shuts off the power when the tamper is lifted from one position to another, thus saving air and wear and tear on the tool which appreciably lowers maintenance.

The New CP Tie Tamper is fully illustrated and described in folder 1646, sent on request.

Chicago Pneumatic Tool Co.

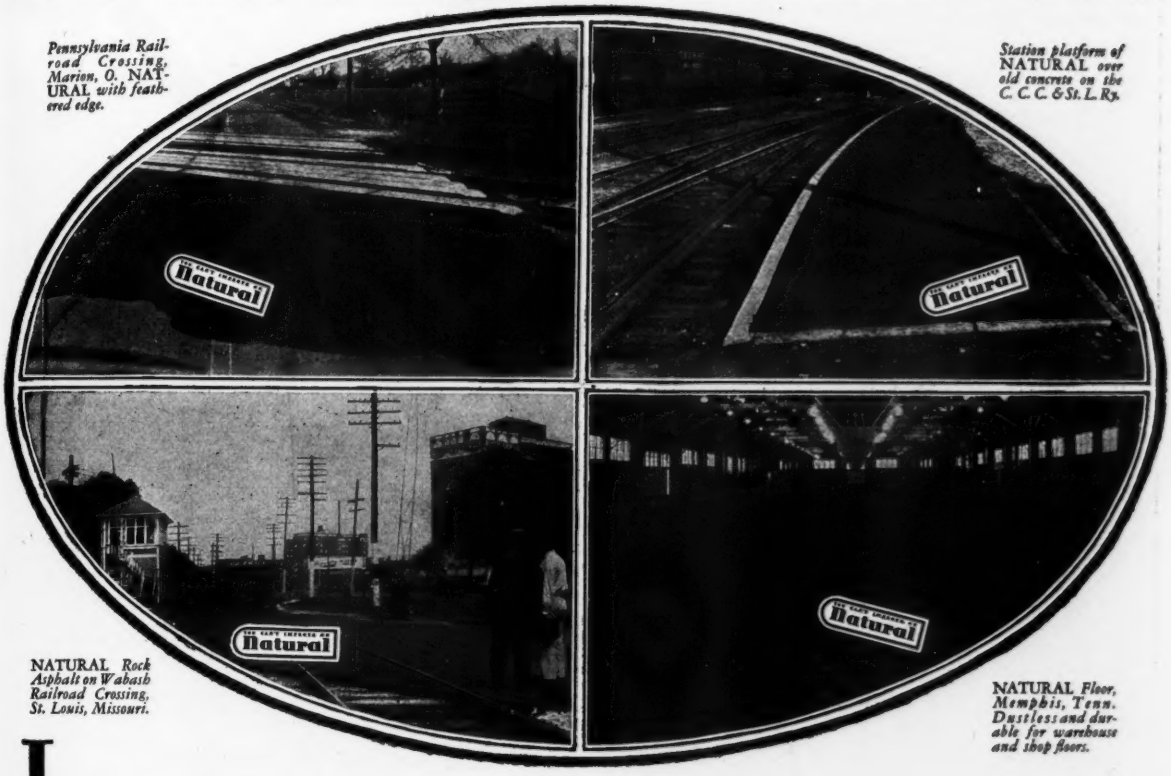
Railroad Department

6 East 44th St. New York | 1004 Mutual Bldg. Richmond, Va. | 310 S. Michigan Ave. Chicago

P-287

YOU CAN'T IMPROVE ON **Natural**

ROCK ASPHALT OF A THOUSAND USES



Pennsylvania Railroad Crossing, Marion, O. NATURAL with feathered edge.

Station platform of NATURAL over old concrete on the C. C. C. & St. L. Ry.

NATURAL *Rock Asphalt on Wabash Railroad Crossing, St. Louis, Missouri.*

NATURAL *Floor, Memphis, Tenn. Dustless and durable for warehouse and shop floors.*

Laid cold, right over the old base *and used immediately*

Re-surfacing with Natural Rock Asphalt is probably the simplest and least costly of all paving jobs. Expensive preparations and troublesome traffic diversion are not necessary. Natural Rock Asphalt is laid cold, just as it is received, right over the old surface and is ready for immediate use.

Any solid surface, strong enough to support the required load can be used. Old concrete, brick, crushed stone, gravel, wood . . . all make good bases for Natural Rock Asphalt and save the cost of a new excavation and base.

Crossings, platforms, warehouse and shop floors, etc. re-surfaced with Natural Rock Asphalt are often more satisfactory than new construction, because they have become thoroughly settled and compacted through use. Any failures that have occurred may be detected and built up before the new surface is laid.

Natural Rock Asphalt is quarried from the famous Pottsville formations in Edmonson County, Kentucky. Its characteristics are a mineral content of hard, sharp, angular silica sand and stable, full-bodied, asphalt cement. Nothing is added to it or taken away from it. Its uniformity is assured by constant tests. It keys readily and produces a non-skid surface that does not shove nor wave. Shipped in easily unloaded, open-top cars, or convenient drums. May be stored in the open.

Mail this coupon for free book describing Natural Rock Asphalt and its uses.

The Prendergast Co., Marion, Ohio. Send me your free book, *Natural Rock Asphalt for Railroads.*

Name.....

Address.....

.....

NATURAL ROCK ASPHALT CORPORATION, *Incorporated*, LOUISVILLE, KY.

(The PRENDERGAST CO., Marion, Ohio, Railroad Distributors)

Railway
Engineering and Maintenance

Volume 24 August, 1928 No. 8

The Trend Towards Heavier Rail

ON ONE division of an important railway the standard rating for trains in 1905, with the grades and motive power then existing, was 300 tons. Today with the present grades and locomotives, 9,000 tons is the standard rating. While this development is more striking than that which has occurred on the average division, it is indicative of the transition that has been and still is taking place on the railways. It is this demand for larger trains that is making it necessary to provide a stronger track construction. Conversely, the reconstruction and strengthening of the track is making it possible to operate heavier trains and thereby reduce the cost of operation.

The magnitude and extent of the present movement for the strengthening of the track, as indicated by the adoption of heavier rail sections, is presented in an article on page 328. This article shows that the railways of the country are now going through a major change in their track construction standards. This, of course, involves a heavy additional expenditure for materials which is justified in part by the contribution that it makes to the operation of heavier trains, but even more by the fact that it reduces the amount of labor required to maintain tracks to a given standard. These new standards create new conditions which should be studied carefully by maintenance officers to insure that full advantage is taken of them.

Should Sections Be Lengthened?

ONE suggestion that is always sure to arouse an argument among a group of roadmasters is to the effect that sections should be lengthened. No other single question arouses as much interest and as universal opposition. Yet, it will not down and on more than one road it is receiving serious consideration today.

In support of this suggestion attention is called to the steadily increasing weight of the rails and other materials that must be handled; to the more general equipment of gangs with labor-saving machinery of one kind or another that requires more men to keep it working with the maximum efficiency; to the growing necessity for more highly trained foremen to meet the exacting maintenance requirements of today; to the shortening (in effect) of sections through the very general use of motor cars with their higher speeds of operation, etc.

In rebuttal, the roadmaster points to the more exacting character of maintenance required today, with its necessity for more intimate supervision and inspection, the increasing diversity of "handy man" tasks thrust on the track forces by the growing complexity of railway activities, the change in the type of labor employed with the necessity for its closer supervision, etc.

There is much food for thought in the points raised on both sides of this question. It is not our purpose here to suggest a solution but rather to emphasize the fact that since the section gang is the basic unit of the maintenance of way force, its organization should be studied constantly in the light of changing conditions in order that it may at all times work most efficiently under the conditions then existing. Rather, therefore, than being a question which should not be raised, it is one that should be considered constantly.

Whatever Is Worth Using Is Worth Applying Properly

IS THE TIE plate worth while or is it a menace? In view of the practical unanimity with which the railways now include tie plates in their standard track construction such a question would appear to be irrelevant at this late day. Yet, it might be illuminating to more than one supervisory maintenance officer to ascertain how many of his foremen, and possibly of his roadmasters as well, appreciate the functions of a tie plate and the importance of installing it so that it will perform these functions. Two observations made during the past month illustrate this point.

In one case, an examination of the work being done by a gang engaged in relaying rail on an important main line of a road of high maintenance standards, where new tie plates were being applied out of place, showed that the plates were being placed with little regard to their relation to the rail. As many as five or six plates were noticed repeatedly in single rail lengths where the rail rested on the shoulder, not infrequently at an angle. Observation of the gang at work showed that the men placing the plates threw them down on the ties carelessly and that they were spiked practically as laid. Nor was this a temporary lapse in practice on the part of a few men for an examination of the track already laid showed that it had prevailed for miles.

A few days later, on another road several hundred miles from the first, similar conditions were noted. Here, a smaller proportion of the plates were so placed that their shoulders were under the rail, although this was observed with at least 10 per cent of the plates, but many of the plates, although of inadequate size, were so carelessly placed as to project far over one side of the tie, with the result

that a considerable number of plates provided less than half of the bearing possible.

It is self-evident that any foreman who will place tie plates as carelessly as these practices indicate lacks an appreciation of their purpose. Further than that, any roadmaster who tolerates such a practice among his foremen shares in this lack of appreciation. Tie plates are recognized today by authorities in track maintenance as a necessary track accessory. The investment in them runs into a large sum. If this investment is to be warranted, the plates must be so installed as to serve most fully the purpose for which they are intended, for it is only in this way that they can earn the maximum return. It is obvious that in both of the instances cited, the tie plates were of little value. In fact, in both of these cases it is doubtful whether the plates were not actually a menace, for the manner in which they were laid provided an inequality of bearing for the rails which will induce breakage.

There is a danger, in the use of all materials, that after they once become standard, supervisory officers will feel that they no longer require attention. It is in such conditions that careless practices creep in and are allowed to go undetected. If a tie plate, or any other track accessory for that matter, is worth buying, it is worth applying properly. It is the duty of every supervisory officer to see that the forces under his direction use the materials given them in the proper way. Instances such as those cited, which can be duplicated on other roads, show that we have not yet reached perfection in supervision.

Meet It with an Open Mind

"DON'T SEND us any more of your new-fangled equipment. We don't want it. We can get along better without it." Such was the reply made to a system maintenance officer recently by the superintendent and his roadmaster on one division of a system, on which outstanding developments have been made in the utilization of labor-saving equipment in track work elsewhere. It reflects an attitude which must be overcome in the introduction of almost every new tool or device—an attitude which is retarding the development of such equipment and is costing the roads large sums by reason of the postponement of the savings possible.

In the case in question, the system officer had demonstrated by extended service on other divisions that the equipment which he recommended would effect marked savings. Yet, the officers of this division, had concluded after limited trial, that it would not work, overlooking the fact that by so doing they were admitting that they were less capable than the officers on the other divisions which had made it work and had realized the economies possible thereby.

In another instance a foreman and his roadmaster, who were under criticism because of their failure to line up tie plates accurately with relation to the rail, attributed the blame to some pneumatic spike driving machines that had been sent them for trial, overlooking the fact that these machines had nothing whatever to do with the location of the tie plates, but merely drove the spikes in the locations fixed by the slots in the plates.

Such is the illogical attitude assumed by not a few maintenance officers in their consideration of new equipment. Of course, not every unit of equipment is practical. Not a few are discarded and properly so. If we are to progress, however, it is important that each machine be judged with an open mind by officers willing and eager to take advantage of every possibility for improvement and to aid in the elimination of defects.

The Method of Approach

IN THE utilization of labor-saving equipment, it may be adapted to existing methods of performing work or the methods may be revised to adapt them to the equipment. In general, the first practice has been followed by maintenance officers and such progress as has been made in the utilization of mechanical equipment has been with relatively small revision of old methods. It is doubtful, however, if this has led to the best results in most cases.

On the Chicago & North Western the opposite practice has been followed. Here, the problem of relaying rail was approached last year and that of resurfacing, following the renewal of rail this year, from the standpoint of building an organization around the equipment available in an effort to utilize it to the maximum. As indicated in an article on page 337, this has led to numerous departures from generally accepted practices in the handling of these tasks. It has, resulted however, in the development of methods of operation that have shown marked advantages in rapidity of performance and cost of work over the practices previously followed. The progress that has been made by this road in the adaptation of mechanical equipment to these major maintenance operations constitutes a valuable contribution to the development of more efficient methods for track maintenance which are not only deserving of consideration by other roads but should also serve as a stimulus for similar studies elsewhere.

The Treatment of Ties

A DEVELOPMENT of outstanding interest to railway maintenance men is indicated in the statistics of the output of wood preservation plants for 1927, published on page 339 of this issue. This is the marked increase in the number of cross ties treated last year, when a total of 74,231,840 ties were protected against decay or 11,577,302 more than in any previous year.

According to recent compilations of the Bureau of Railway Economics, the Class I railways of the United States bought 97,135,000 ties last year. Since practically all of the ties treated were purchased by these roads, it is evident that approximately 75 per cent of all of the ties bought by them last year were treated. While this indicates that more than 20,000,000 ties were inserted in the tracks of Class I railways last year without treatment, the proportion being treated each year is growing so rapidly that the use of untreated ties will soon be considered as wasteful of timber as the use of hand cars is of men's time.

The rapidly increasing adoption of treatment for ties is not without its problems, however. The records on which the economy of timber treatment has been built up, have been made on roads which have surrounded their treating procedure with many precautions relative to the selection of timber and its care during seasoning, the choice of the preservative and the manner of its injection into the wood. These

precautions are necessary preliminaries to satisfactory results, and unless this fact is realized by the roads which are now going to timber treatment, there is certain to be disappointment.

It is not sufficient for a road merely to decide to treat its ties. Rather, it must watch every step in the preparation of its timber, from the tree to the track, with as great care as it supervises the protection of its rails. Such care is not now universal, and the true friends of timber preservation should see that shortcomings in present practices are corrected wherever they now exist in order that there may be no reaction when the ties which are now being treated for the newer converts to wood preservation come out of the track.

Amateur Concrete Work

A LEADING authority on concrete recently said that if he were going to build a house he would make every effort to reduce the amount of concrete required to the minimum. Coming from a man who has so much confidence in concrete that he favors the use of higher unit stresses in design than those now commonly employed, this statement, at first thought, is hard to understand. But the reason for it should be apparent to any railway man who is engaged in masonry construction, for surely he has seen enough of the work of the small contractor who does sidewalk and dwelling house foundation work to know that much of it is poorly done. It does not necessarily follow that such work is always doomed to early failure. The objection to poor work is that it constitutes an indifferent use of materials and a shorter life for the structure than could be had at no increase in cost.

This is in no sense an indictment of concrete, nor does it raise any doubt concerning the durability of well-made concrete. Neither does it imply that the average small concrete contractor is dishonest. It is true, of course, that there are men who will "skin the job" by using lean mixes, but the real reason for poor work is that many so-called concrete men *do not know* how to make good concrete with the best of materials. As an illustration, a sidewalk contractor who was asked to protect his work from the hot sun, stated that he had never heard that concrete was weakened by the evaporation of the water from the exposed surfaces.

The railroads were among the leaders in the general use of concrete for bridges. They were among the first to adopt improved practices in proportioning, based on the results of the more recent investigations of materials and methods. It is safe to say, therefore, that the quality of railroad concrete averages as high as that to be found in any class of structures. This is particularly true of the work done by or under the direction of bridge and building men, who are keeping abreast of developments in the subject.

However, not all concrete work on the railroads is handled under the care of men experienced in its production. On some roads, concrete for signal foundations is made by men whose specialty is signaling rather than concrete. Other organizations not regularly engaged in concrete construction also do concrete work of a minor character, and it will not be surprising if the work they turn out should not all be well done. It is up to the man who knows how, to take such steps as he can legitimately to the end that improper practices be corrected. The railroad pays the bill for poor work, whether it is done by the bridge department or some other.

New Books

Proceedings of the American Wood-Preservers' Association, 328 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by the Association, 228 No. La Salle Street, Chicago.

This volume contains the complete report of the proceedings of the 24th annual convention, which was held at Montreal, Que., on January 24-26. Of particular interest to railway engineering officers were papers presented by G. J. Ray, chief engineer of the Delaware, Lackawanna & Western, on What the Lackawanna Has Gained from the Treatment of Ties, and by Earl Stimson, engineer of maintenance, Baltimore & Ohio, on The Economy of Framing Structural Timbers Before Treatment. Other information of special interest to railway men included papers on The Checking of Hard Maple Ties, by J. H. Harkom of the Forest Products Laboratories of Canada and on The Failure of Cross Ties from Unusual Causes, by Galen Wood, consulting engineer, Philadelphia, and reports of the Committees on Tie Service Records and on the Treatment of Car Lumber. The proceedings of this association constitute a continuing record of the development of the technique of the preservation of timber which is of value to railway maintenance officers, the largest users of treated timber.

Safety and Production. A Report by the American Engineering Council. 414 pages. Bound in cloth, 6 in. by 9 in., illustrated. Published by Harper & Brothers, New York. Price, $5.

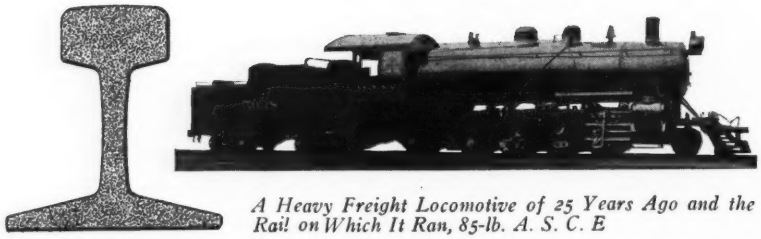
The outstanding development in American industry in recent years has been the increase in production per employee. Figures compiled by the United States Department of Commerce show that between 1919 and 1925 there was an increase of 28.6 per cent in the physical volume of products, with a decrease of 8.6 per cent in the number of persons engaged in their production, resulting in an increase in productivity of 40.7 per cent per person engaged.

During this same period there was a marked increase in the number and severity of accidents. The first to notice this increase were the casualty insurance companies. Two years ago the National Bureau of Casualty and Surety Underwriters, concluded that the increase in industrial accidents had become so serious as to warrant a careful and dispassionate study on a national scale. This bureau, therefore, proposed to the American Engineering Council that the council undertake such a study. A committee of 10 eminent engineers was appointed to conduct this investigation, among whom was a representative of the steam railway industry, C. F. Loweth, chief engineer of the Chicago, Milwaukee, St. Paul & Pacific.

Their findings are presented in this volume of 414 pages. For convenient reference, the findings of the committee are presented in a summary of 23 pages, which is followed by more extended description of the committee's investigations in the various industries studied, one of which was the steam railway industry.

The committee concludes that a material reduction in accident rates can be obtained simultaneously with an increase in production rates and that efforts to improve safety performance do not interfere with production. It recommends that the same executive direction and control be given to decreasing industrial accidents as is given to increasing productivity.

Catching Up With



A Heavy Freight Locomotive of 25 Years Ago and the Rail on Which It Ran, 85-lb. A. S. C. E

A Review of Measures Railways Are Taking to Provide Rails of Adequate Weight for Traffic of the Present Day

THE outstanding trend in maintenance of way practices today is the increasing use of heavier rails. This is strikingly illustrated by the statistics of rail production in this country as compiled by the American Iron and Steel Institute. These figures show that, whereas the tonnage of rails weighing 100 lb. or more per yd. constituted only 26 per cent of the total output in 1917, and 42 per cent in 1922, this ratio had risen to 68.8 per cent of the total output in 1927, and further, that of this classification, approximately 32 per cent, or almost one-fourth of the total output in 1927, was in sections weighing 120 lb. or more per yd.

The steadily increasing weight of motive power, together with the speeding up of freight as well as passenger service, have exerted a marked influence on the character of track required to carry present day traffic. While, in general, the weight of rail has not increased in proportion to the traffic loads, the roadway as a whole has been markedly strengthened during the last decade, and considerable progress has been made in providing heavier and better rail. In this latter field, the intensive studies of the Rail committee of the American Railway Engineering Association, which have borne fruit in better sections and in an improved quality of steel, must be accorded full recognition.

The race between axle loadings and the weight of the rails carrying those loads has been in progress since railways came into being. From about 1890 to 1910, a considerable increase was made in the weight of main-line rail, particularly on the western roads, but toward the end of this period the weight of motive power again advanced and maintained a commanding lead until the last few years, when the gap between the two was lessened considerably. This has been due to a better understanding of the respective needs of the transportation, motive power and maintenance of way departments and to the co-ordination of efforts to adjust these needs. The work accomplished by the A. R. E. A. Special Committee on Stresses in Railroad Track has brought to light many data of value alike to the designers of locomotives and of track, and there is reason to believe that these studies will result not only in lessening the destructive forces of the locomotive, but also in further improvement in the rails and fastenings to withstand these forces.

Locomotive Design to Ease Stresses in Rails

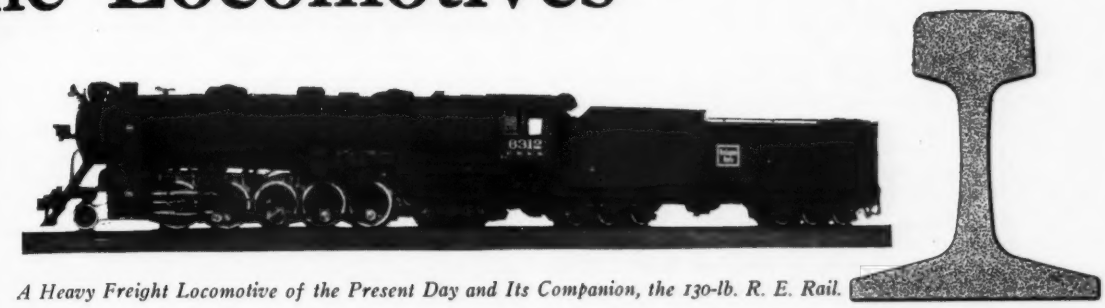
In this connection it is noteworthy that the Atchison, Topeka & Santa Fe, which for several years has carried on studies with special reference to the stresses imposed on the track, has recently placed in service a passenger engine of the 4-8-4 type, with a total weight on drivers of 269,400 lb. and with a load of 70,600 lb. on the axles of the main drivers. Tests conducted under service have demonstrated that this locomotive, traveling at 60 miles an hour on tangent track, imposes a maximum equivalent static load on the rails 3,000 lb. less than that imposed by a locomotive of older design of the 4-8-2 type with a weight on drivers of 243,100 lb. and a maximum load of 61,350 lb. on the driving axles. This reduction in stress, in spite of an increase of from 9 to 15 per cent in individual axle loads, is encouraging, particularly to the transportation and motive power departments, since it means that greater power will be obtained without a corresponding increase in the stresses the track must meet. C. B. Bronson, assistant inspecting engineer of the New York Central Lines, reports that recent types of motive power for both freight and passenger service on that road have lower axle loadings as compared with previous types, indicating a tendency on that road to obtain greater tractive effort, while at the same time decreasing weights on the axles.

A Natural Development

The disparity between the weight of rail and axle loadings is the natural outgrowth of the conditions under which the railway systems on this continent were developed. Built as pioneers for the opening of a new country, cheapness of construction was a necessity to procure as great a mileage as possible with the financial means at hand, and this led not only to the adoption of light rails but of heavy grades as well. When traffic increased to a point where it taxed the capacity of the existing facilities, the quickest way to provide relief was the use of heavier motive power, followed later by second track construction and grade reduction when the locomotives had attained a weight beyond which it seemed impracticable to go. While these developments were taking place, some advance was made in the weight of the rails, but in general this increase was not commensurate with the heavier loads they were called upon to sustain. The situation has been aptly described by C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific, as similar to that of "a growing boy who has been furnished with larger clothes and a larger hat, with no larger shoes. We have been backward in increasing the weight of our rail, although during the last two or three years there has been a movement to correct this failure to furnish shoes for the growing boy."

To amplify this statement Mr. Morse has sketched in a graphic manner, the increase in the weight and power of the locomotives on the Rock Island from 1910 to 1926, which is, in general, typical of the other

the Locomotives



A Heavy Freight Locomotive of the Present Day and Its Companion, the 130-lb. R. E. Rail.

large roads in the same territory. In 1910, the Rock Island had 1,306 locomotives, with an average weight on drivers of 60.69 tons, and an average tractive power of 26,690 lb. In the same year, the gross ton miles of freight traffic on that road amounted to 5,598,000,000 with a freight locomotive mileage of 17,512,000. In 1926, by coincidence, the Rock Island again had 1,306 locomotives, but the average weight on drivers had advanced to 83.85 tons, an increase of 38 per cent, and the average tractive power to 38,182 lb., an increase of 43 per cent. In the latter year, these 1,306 locomotives made a total mileage of 17,372,000, slightly less than that made by the same number of locomotives in 1910, but the gross ton miles of freight traffic mounted to 8,317,000,000, an increase of 50 per cent. In 1910, the heaviest rails on the Rock Island weighed 85 lb. per yd. In 1911, the laying of 100-lb. rails was begun on the heaviest traffic lines, and in the following year 90-lb. rails were introduced on the lighter main lines. At the end of 1926, 1,202 miles of 100-lb. rails and 1,362 miles of 90-lb. rails had been laid, the remainder of the 8,000 miles of main track being laid with rails weighing 85 lb. or less per yd. The first 110-lb. rails were laid in 1927, and beginning with the 1928 program, all new rails are to be of the 110-lb. R. E. section.

No Radical Change Until 1908

From the time the T-rail section was evolved from the "pear-shaped" section, about 1836, there was no radical change in the generally adopted design until the introduction of the A. R. A. sections in 1908. During this period, however, there came into use a multiplicity of sections, differing from each other in small and usually unimportant details, which is illustrated by the fact that in 1891 there were rolled in the United States 119 different patterns of 27 different weights of rail. The situation had become so intolerable from a manufacturing point of view, that in 1885 the American Society of Civil Engineers appointed a committee to devise standard sections covering the range of weights in common use at that time. This action resulted in the well-known A. S. C. E. sections for rails weighing from 50 to 100 lb. per yd., varying by 5-lb. increments, the final report of the committee being submitted in 1893. At the time the report was completed the heaviest rail in use was 80 lb. and the sections above that weight were designed to provide for the heavier weights which it was recognized would come into use later. The design was what was commonly known as a "square" section, that is, one in which the height of the rail and the width of the base are the same, and the proportions of the weights of the head, web and base to the total weight are the same for all weights of rail, being 42 per cent, 21 per cent and 37 per cent, respectively.

Rails Are Designed for Greater Girder Strength

These sections came into general use and proved satisfactory for rails up to 80 lb. per yd., but were not so satisfactory in the heavier weights. On this account, the American Railway Association, in 1905, appointed a committee to devise sections for weights of rail from 60 lb. to 100 lb. per yd. The sections recommended by this committee, which were adopted in 1908, consisted of two designs, to be used for different classes of traffic, and which were designated as A and B, the former being intended for high speed lines, while the B section was recommended for slower, heavy freight traffic. In both of these sections, the height was greater than the width of the base, thus providing greater strength as a girder, but for any given weight of rail, the A section was higher, with a comparatively thin head and base.

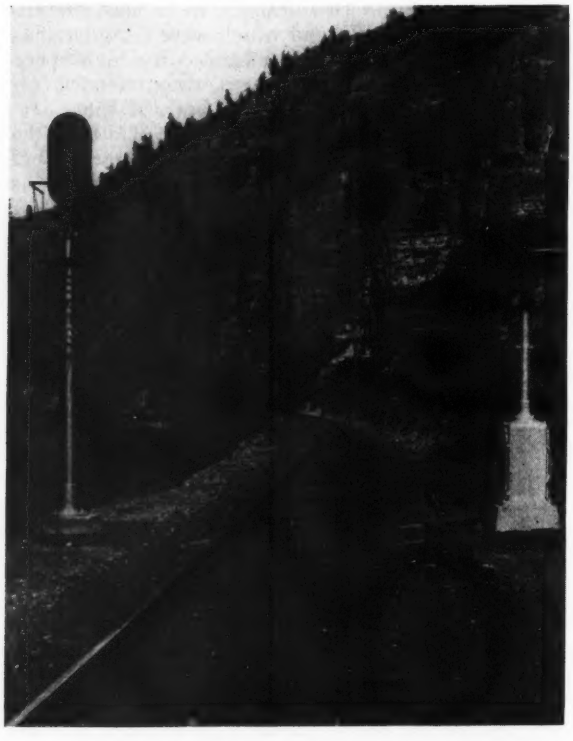
With the adoption of these sections in 1908, the A. R. A. referred the general subject of specifications for steel rails to the A. R. E. A., with the request that that organization prepare a type of section for use as a single standard. The outcome of this action was the design of the A. R. E. A. sections for 100-lb., 110-lb. and 120-lb. rails, which were submitted at the convention in March, 1915, and adopted at that time. No new sections were designated for rails weighing less than 100 lb. per yd., but the 90-lb. A. R. A.-A section was adopted for that weight. The A. R. E. A. has since adopted sections for 130-lb., 140-lb. and 150-lb. rails, and considerable 130-lb. rail of that section has been placed in service.

In presenting the report recommending the adoption of the A. R. E. A. sections, in 1915, Robert Trimble, chairman of the Rail committee, and at that time chief engineer maintenance of way of the Pennsylvania Lines West of Pittsburgh, said in part: "You will note that the designs submitted have in view the feature of the rail as a girder, and we have kept in mind a design having the highest ratio of section modulus to area of section. The radii of the fillets between the head and web, and the head and base, have been made as large as possible without interfering with the bearing of the joint bars.

"Although the committee submits designs for sections weighing 130 lb. and 140 lb. per yd., it does not consider them necessary nor does it recommend them for adoption. We do not think that these sections should be formally adopted, for the reason that we may find it necessary to modify our ideas of these sections before the necessity arises for their use."

The value of stiffness in rails is strikingly shown

by the late A. M. Wellington in his monumental work, "The Economic Theory of the Location of Railways," which was published in 1889, at a time when the heaviest rail weighed 80 lb. per yd. and much of the mileage of the country was laid with 50-lb. rail. In treating of this he says: "In buying rails we are not buying steel; at least we do not care to buy it. We are buying three imponderable qualities: (1) Stiffness; (2) Strength; (3) Durability. If we get our money's worth of these qualities, it is a matter of complete indifference (except for the future scrap value of the steel, which a poor, light traffic road cannot afford to give much thought to) whether we get much or little of steel. If we do not get our money's worth of what we want, our bargain is just as bad, however much steel we get." He then went on to analyze the relative stiffness of rails ranging in weight from 10 lb. to 80 lb. per yd. and showed that, based on the quality of stiffness, the value received for each dollar expended for 80-lb. rail is 60 per cent greater than that expended for 50-lb. rail, or in other words that the sacrifice in buying light rail was the same as if in buying rails, one were in fact, as well as in form, buying steel instead of stiffness, and were to choose 50-lb. rails at a price of $30 per ton (the price prevailing at that time) in the face of a price of $18.75 a ton for 80-lb. rails.



Numerous Roads Are Laying Heavy Rail First on Curves

Similarly, with respect to ultimate strength, he showed that the comparative value received for each dollar was 26.5 per cent greater for 80-lb. rails than it was for 50-lb. rails, and also that the heavier weights were more economical from the standpoint of durability.

Maximum axle loadings at the time Wellington published his book ranged from 25,000 to 33,000 lb., while today the range for modern power is from 60,000 to 70,000 lb. or more. As has been said, the design has been changed since Wellington's time to afford increased girder strength for rails of given weights per yard, but many engineers who have studied the problem feel that still greater girder strength is needed, and for this reason recommend the use of heavier sections to provide that strength.

Advance in Weight of Rails in 1916

A marked advance in the weight of rails was made by the Lehigh Valley and the Pennsylvania in 1916, when the former road adopted the Lehigh Valley section of 136-lb. rail for its heavy traffic lines in place of the 110-lb. rail which had been used prior to that time, and the latter road introduced the 130-lb. Pennsylvania section to replace the former standard of 100-lb. rail. The introduction of heavier sections on the other roads of the country has been slower, although it has moved more rapidly during the last few years.

In order to ascertain the practice of the various roads in the United States and Canada with respect to the present weight of rails for heavy traffic lines and the probable future trend, a questionnaire was addressed to the chief engineers of these roads and replies were received covering a total of 215,000 miles of line, of which approximately 178,000 miles are in the United States. In digesting the information that is presented, it must be borne in mind that it applies only to those main lines handling fast or heavy traffic, or both, but it must also be recognized that the adoption of heavier rail for any given main line of any system operates to provide all the main tracks of that system with heavier rail, since the rail released on the main line is usually relaid in lines of lesser importance, where it releases lighter rail, which in turn, is laid in main tracks of still less importance, and so on down the line.

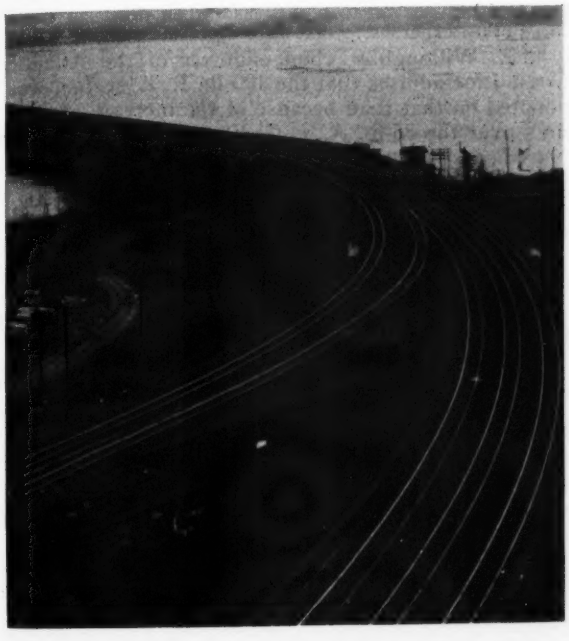
Recent Developments in Use of Heavier Rails

The information contained in these replies shows that roads with a mileage of 60,801, or 28.2 per cent of the total mileage represented, now use rails ranging from 127 lb. to 136 lb. per yd. as their heaviest sections, those with a mileage of 61,853, or 28.7 per cent, use 110-lb. rails, those with a mileage of 75,498, or 35.1 per cent, use 100-lb. rails, and those with 14,318 miles or 6.6 per cent, use 90-lb. rails, while two roads with a mileage of only 2,797 use 85-lb. rails as their heaviest section. W. S. Hanley, chief engineer of the St. Louis-Southwestern, one of these roads, states that while the 85-lb. rail has given satisfactory results with the present tonnage and axle loadings, the use of heavier rail has been considered to increase the margin of safety for anticipated heavier driving axle loads and also to secure the benefit of decreased train resistance. J. W. Williams, chief engineer of the Western Pacific, also says that the 85-lb. section has been satisfactory on that road, adding that they do not consider it advisable to make a small increase in weight of rail and that they do not feel that the time has arrived to adopt the 100-lb. or 110-lb. section.

The greatest number of roads have increased the weight of rails in the last five or six years. In 1922, the Southern adopted 130-lb. rails as standard on certain parts of its line and 100-lb. rails on certain other portions where 85-lb. rails had been used previously. In the same year the Great Northern adopted 130-lb. rails for curves sharper than 5 deg. and also for continuous installation on certain mountain divisions, while the 110-lb. section was adopted

as standard for other main line locations in 1926, both of these superseding 100-lb. rails. In 1923, the Northern Pacific also began laying 130-lb. rails on sharp curves and in long tunnels and will also use this weight in other locations of severe service. In the same year, it adopted 100-lb. rails for tangents and light curves on its main line. The Southern Pacific adopted 100-lb. rails for its heavy-traffic main lines in 1922, to replace the 90-lb. section, and in 1927, began the use of 130-lb. rails for curved track.

In 1923, the Atlantic Coast line, the Nashville, Chattanooga & St. Louis and the Kansas City South-



The Pennsylvania Has Been a Pioneer in the Use of Heavy Rails

ern adopted 100-lb. rails as standard for their heavy-traffic lines, the first named having used 90-lb. rails previously, while the heavier section supplanted 85-lb. rails on the K. C. S. and 80-lb. on the N. C. & St. L. The Atchison, Topeka & Santa Fe began the use of 110-lb. rails to replace 90-lb. in 1924, and in the same year the Seaboard Air Line adopted 100-lb. rails to replace 85-lb. rails.

In 1925, the New York Central System adopted the 127-lb. Dudley section to supersede the 105-lb. Dudley section which it had used theretofore, while the New York, Chicago & St. Louis, began the use of 110-lb. rail instead of 100-lb. During the same year the Texas & Pacific adopted 110-lb. rail to replace the 85-lb. rails which it had used before that time, and the Illinois Central and the Wabash adopted 110-lb. rails instead of 90-lb. The Richmond, Fredericksburg & Potomac went to the use of 130-lb. rail in 1926, and in the same year, a large western road adopted 110-lb. rail in place of 100-lb. In 1927, the Chicago, Milwaukee, St. Paul & Pacific began the use of 130-lb. rail for its more important lines, taking 20 per cent of its new rail tonnage in that section and the remainder in 100-lb. rail, which had been its standard for some years prior to that time. The Chicago & North Western and the Chicago, Rock Island & Pacific adopted 110-lb. rails for their more important lines in the same year to replace the 100-lb. rails which they previously used. During the present year the St. Louis-San Francisco and the Pere Marquette began the use of 110-lb. rail, the latter road changing from 90-lb., and the former road from 100-lb. The Chesapeake & Ohio has used 130-lb. rail in the last few years to replace 100-lb. rail as rapidly as conditions would justify and is considering rail sections heavier than 130 lb. but no change to such sections will be made in the immediate future.

Few of the roads which have changed to heavier rails, recently, contemplate any further changes in the immediate future, but the Kansas City Southern will install 10-mile experimental sections of 115-lb. and 127-lb. rail of the Dudley section. The Buffalo, Rochester & Pittsburgh, which has been using the 100-lb. A. S. C. E. section since 1912, is giving consideration to the 115-lb. Dudley section and the 120-lb. R. E. section, and will probably change to one or the other of these sections next year. E. F. Robinson, chief engineer of that road, states that a small tonnage of 115-lb. Dudley rail was laid in 1925 and that the results have so far proved very satisfactoy as to the cost of track maintenance, life of rail, reduction of rail failures and improvement of track conditions. The Delaware & Hudson, which now uses the 90-lb. A. S. C. E. section, is considering the adoption of either the 127-lb. Dudley or the 130-lb. R. E. section, according to H. S. Clarke, engineer maintenance of way, who states that one of these sections would serve best for the traffic and alinement conditions on that road. He also says that the small tonnage of new rail required by the D. & H. makes it desirable to use a section for which special rolls are not required. E. A. Hadley, chief engineer of the Missouri Pacific, advises that no change in weight or type of rail has been made on that road for some years, but that as far as can be foreseen the 110-lb. section will be adopted when the change is made. When the heavier rail is adopted by this road it is probable that its use for a period of time will be confined to territories where the traffic is heavy and there are many curves, as an aid to maintaining better line and surface under such conditions.

Reasons for Heavier Rails

The reasons advanced for adopting heavier rail were varied, but came under one or all of four general headings, which include the expectation of a reduction in maintenance of way expenses, increased life of the rail, a reduction in rail failures and an improvement in track conditions. While it is felt generally that all these desired results have been attained, in many cases the heavier rail has not been in service long enough to permit it to be compared directly with the lighter rail. This is further complicated by the fact that it is often impossible to segregate the values of improvements in the track between those due to reballasting and those due to the heavier rail. Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis, has paid much attention to the subject and we present his views in full, as follows:

"I regret that I am not yet in position to give tangible and definite results obtained from our increase of section except the increased factor of safety, and even in this case, where reballasting has taken place, which has been quite general on our heavy traffic lines, it is impossible to draw a distinction between the contribution toward safety made by the heavier section, and that by the reballasting.

"It seems apparent that we will obtain a considerable increase in the life of the 110-lb. rail over the 90-lb. This view is based upon comparisons between the two weights

of rail rolled in the same period and at the same mill, and observed since 1923 on the same type of track under the same gross tonnage. We have found, on account of the softness of both sections of rail rolled since 1923, that rail battering and overflow have been excessive as compared with 90-lb. and lighter rollings prior to that time. The battering has been such as to make it necessary to resort to welding in order to retain the rail in track. This has been considered more economical than to remove the battered rails and resaw them.

"As to a reduction of rail failures, it is not feasible to differentiate between the advantages gained from the heavier section and extensive reballasting, and the increased maintenance incurred on account of the lighter section. We are not in a position to make an intelligent comparison between rail failures other than those arising from battered ends and side flow on the two types of sections rolled since 1923, for the reason that there are only a few scattering places where 90-lb. rail is used under the same conditions as the 110-lb. rail. Excluding failures due to battering and flow, failures of 110-lb. rail used under the heaviest traffic have been much fewer than of the lighter sections of earlier rollings carrying medium traffic.

"Concerning improvement of track conditions, variability in the bearing power of the underlying soils presents another phase of uncertainty when it is attempted to draw the line between the advantages gained by the heavier over the lighter section. In regions where our roadbed is of a sandy nature and where the character of the regional rocks is igneous, we are comparatively free from the giving way of the underlying soil, but in sedimentary formations there are certain clays and marls which absorb moisture at a rapid rate and become almost fluid, squeezing out from under the roadbed at a rate proportional to the type and density of the traffic. This clay is also pressed and pumped upward into the ballast, fouling it to such an extent as to make forking or cleaning by ordinary processes impossible. Continual reworking of such track, regardless of the weight of rail, is found necessary, but the heavier rail obviously presents a decided advantage from the standpoint of safety under these conditions, since it tends to distribute the load more evenly over soft spots, no matter from what cause they arise. Underdrainage seems to be the most feasible remedy for soft underlying strata, but on account of topographical conditions, this is not always possible within reasonable cost and must necessarily be deferred where there is a probability of early grade reduction operations being undertaken. Another element of difficulty in making comparisons with respect to improvement in track conditions due to the use of heavier sections is the well known fact that new rails of the same section are much more easily maintained for several years after laying than the old rails which they replaced."

Probable Trend in Weight of Rails

Mr. Morse, of the Rock Island, anticipates securing the various advantages from the heavier rail, and sees in the improvements that have been made in the track structure an indication that the weight of rail on the western roads will increase more rapidly in the future than it has in the past. Mr. Morse says:

"My own idea is that the majority of the railroads in the West have been slow in increasing the weight of their rail to conform to the increase in weight of locomotives and rolling stock. Practically all of the roads have strengthened the roadbed by widening it, and we have increased the depth of our ballast and also the number of ties to the panel. We have also equipped our track with tie plates and rail anti-creepers, all of which have cost a huge sum of money. However, while doing this we have not, until the last two or three years, increased the weight of our rail.

"During the period from about 1887 to 1910 we made rapid progress, increasing the weight of our rail from 56-lb. to 85-lb. and 90-lb. rail, and during that time we offset the increase in weight of rolling stock, but about that time, most of us stopped increasing the weight of our rail, while the weight of our locomotives and rolling stock kept on increasing. It is going to take from 5 to 10 years of an ordinary rail-laying program to catch up with our rail somewhere near to what we have been doing in locomotives. My own thought is that by the end of another 10 years our average weight of locomotives will have increased to a point where it will be necessary to make another increase of 10 or 15 lb. per yd. in the weight of our rail, and that when the 110-lb. rail that we started laying this year requires renewal, it will be replaced with 120-lb. or 125-lb. rail.

"The 110-lb. rail is only about 22 per cent heavier than the 90-lb. rail, while on the Rock Island, the increase in the weight on drivers of our locomotives from 1910 to 1926 was 38 per cent, and the increase in the tractive power of our locomotives was 43 per cent. Therefore, by going to 110-lb. rail, we will not have increased the weight of our rail as much as we have increased the weight and tractive power of our locomotives.

"I expect, however, that the weight of our rail will increase more rapidly in the future, as the majority of the roads have already gone to the expense of widening their roadbeds, increasing the depth of ballast, adding to the number of ties to the panel, using tie plates and anti-creepers, and strengthening the bridges. Therefore, they will have a larger amount of money to spare for the purchase of heavier rail than they had when they had all of these other expenses to take care of in the past."

J. E. Willoughby, chief engineer of the Atlantic Coast Line advises that the 100-lb. R. E. section was adopted on that road because of the increase of stiffness over the 85-lb. A. S. C. E. section which it replaced, and that an increase of from three to five years over the life of the latter section is expected. He adds that no reduction has been made in the number of men to the section since the heavier rail was laid, and that there has been no noticeable decrease in rail failures.

The chief engineer of an important eastern road is of the opinion that the Lehigh Valley 136-lb. section is the best that has yet been developed, citing as its advantages its high girder strength, which provides a desirable distribution of the load to the roadbed; its base, which is slightly wider in proportion to the height of the rail than are those of other late sections, providing a better bearing on the ties and a better distribution of lateral pressure; and a deep fishing space, which permits the use of a substantial joint to strengthen the track structure at its weakest point.

Specific Benefits From Heavier Sections

Other roads have more specific data to offer on the advantages obtained by the heavier rails. The Canadian National began replacing its 85-lb. rails with 100-lb. rails some years ago, and M. S. Blaiklock, assistant chief engineer, states that under the same conditions the heavier rail shows a saving of about $100 per mile per year in maintenance costs; that the life of the rail is increased about 30 per cent; that rail failures are only about half the number that occurred in the lighter sections, and that line and surface are easier to maintain, while there is less damage to the ties. J. M. R. Fairbairn, chief engineer of the Canadian Pacific, which road adopted the 100-lb. section in place of 85-lb. rails in 1921, says that the reduction in rail failures in the heavy rail has been "very substantial," and that the riding qualities of the track have been improved, while its safety has been increased, due to the reduction of rail failures.

According to C. J. Geyer, engineer maintenance of way of the Chesapeake & Ohio, the cost of maintenance is reduced by the use of heavier rails, but variable conditions do not permit showing this saving on a percentage basis. He further says that experience indicates the life of the 130-lb. rails will be about double that of 100-lb. rails under the same traffic; that the rail failures in the 130-lb. rails are 22.4 per cent under those in the 100-lb. rails, and that by the use of 130-lb. rails in place of 100-lb. rails, track conditions are improved with the same labor allowance or can be held at their former condition with a reduction in labor expense.

W. G. Brown, engineer maintenance of way of the

Florida East Coast, where the 90-lb. section was adopted in 1920 to replace 70-lb. main line rail, says that track conditions have been improved considerably since the introduction of the heavier rails, but that this has been due partly to the application of more ballast. He also says that "there has been quite a reduction in rail failures" and adds that while some consideration was given to the 110-lb. and 130-lb. R. E. sections two years ago, it is not likely that either of these will be adopted within the next few years.

Fewer Rail Failures

J. R. W. Davis, chief engineer of the Great Northern, states that the cost of track maintenance is reduced owing to the better joints, a better distribution of the rolling load, and a reduction in the wave movement of the rail. He says also that the life of the rail is increased on account of the higher carbon content of the larger sections and that there has been a reduction in rail failures, largely in proportion to the decrease in the unit stresses in the large sections. has been a considerable reduction in rail failures in the 110-lb. rails as compared with those of 90-lb., as is shown in the subjoined statement.

Year Rolled	Year Ending	Weight of Rails	Failures Per 100-Mile Years
1925	October 31, 1926	90-lb.	18.07
1925	October 31, 1926	110-lb.	4.00
1925	October 31, 1927	90-lb.	20.22
1925	October 31, 1927	110-lb.	4.95
1926	October 31, 1927	90-lb.	24.51
1926	October 31, 1927	110-lb.	4.90

On the New York Central, Mr. Bronson says that the necessary data have not yet been secured as to the effect of heavier rail on the cost of track maintenance, although an increase of several years in the life of the heavy rail is anticipated. He says further that, with the exception of an occasional crushed head in the rails rolled by one mill, there have been practically no failures in the 127-lb. rails. E. M. Hastings, chief engineer of the Richmond, Fredericksburg & Potomac, reports that the cost of track maintenance has been reduced, that the life of the

The Lehigh Valley Has Made 136-lb. Rail Standard on Main Lines

The 130-lb. P. S. section was chosen on account of its large head, which provides a greater wearing area.

W. H. Penfield, engineer maintenance of way of the Chicago, Milwaukee, St. Paul & Pacific, advises that the reasons for adopting the heavier sections on that road were to reduce maintenance expenses, not so much in the actual cost of rail replacement as in the labor to maintain the track in line and surface; a reduction in the tie renewals, and a better class of track. The selection of the 130-lb. rail to replace 100-lb. rail on the principal main-line divisions was made to provide properly for the present traffic as well as for a period of from 15 to 20 years in the future, and the same considerations led to the adoption of 100-lb. rail on lines where 90-lb. was formerly used. The replacement of the 100-lb. and 90-lb. rail has also furnished relay rail to displace rail on secondary lines which was too light for the traffic. Actual figures as to the economies effected are not yet available, but the short life of the lighter rail and the difficulty in maintaining track where it was used under heavy traffic indicate that substantial savings will be made, with a reduction in rail failures.

A. F. Blaess, chief engineer of the Illinois Central reports that it is not necessary to expend as much labor in keeping up the track with the 110-lb. rails as was necessary with 90-lb. rails, and that there 130-lb. rails is expected to be 75 per cent greater than of the 100-lb. rails which they replaced, and that there have been no failures in the 130-lb. rails since they were installed in 1926. Both Mr. Bronson and Mr. Hastings say that there have been noticeable improvements in track conditions due to the use of the heavier rails.

Longer Life Demonstrated

Louis Yager, assistant chief engineer of the Northern Pacific, reports that the condition of 130-lb. rails, which had carried traffic for three years on sharp curves, indicated that they would be in place another three years before it would be necessary to replace them, while 90-lb. rails on the same curves usually lasted only 18 months. Apart from the economy derived from the increased life, the amount of regaging is considerably less with the heavier rails, the only regaging being occasioned by the lateral wear on the high rail, while with the 90-lb. rails, regaging was necessary not only because of lateral wear, but also because of the tendency of the rails to tilt outwardly, on account of the smaller tie plates sinking into the tie. The 130-lb. rails, with the wider base and larger tie plates, have obviated this latter trouble, with a consequent decrease in the labor for regaging and surfacing. He adds: "Our experience thus far

clearly demonstrates that the increased investment in the 130-lb. rails for curves and other places of severe wear is paying us greater returns in maintenance economy than any other improvement in our track standards in recent years. The stiffer section also gives us greater assurance from the standpoint of safety."

J. B. Akers, assistant to the vice-president of the Southern, states that the cost of track maintenance is being decreased by a reduction in the wear on the ties due to the greater rigidity of the heavier rails and the use of tie plates on all ties. The increase in the life of the rail is indefinite, and while the failures in the 130-lb. rails are not as great as in the 85-lb. A. S. C. E. section, they have increased in the 100-lb. rails, particularly in head failures. Lem Adams, roadway assistant on the staff of the president of the Union Pacific, advises that, while they have no direct figures as to cost of maintenance, the general reduction is considerable, that rail failures are reduced, and that the increase of life in the heavy rail will be between 30 and 40 per cent. Track conditions have been improved, owing to the greater rigidity of the heavy rail.

Further Improvements Desired

While the general view is that the quality of steel has been improved, and that the use of heavier rails has been of marked benefit, the observations of many of those furnishing data show that still further improvements are desirable. The principal deficiencies cited in present-day rails include a predisposition to transverse fissures and other internal defects; softness of the metal, resulting in excessive wear on curves, as well as battering and chipping; and lack of uniformity in the quality of the steel. Mr. Morse, of the Rock Island, feels that the greatest deficiency in rails today is the lack of heavy rails. He also cites transverse fissures and the rapid wear of rails on curves, but hopes that the new transverse fissure detector car, which is being developed by the A. R. A., will be successful, and thus render unnecessary the practice of removing all the rails from any heat as soon as that heat has developed three transverse fissures. He feels that curve wear will be minimized by the use of flange oilers, either on the locomotive or affixed to the rails.

The chief engineer of a large western road says that the greatest need is stronger joints, in which view he is supported by Mr. Hanley, of the Cotton Belt, who believes that improved joints would do much to eliminate the battering of rails. Mr. Yager, of the Northern Pacific, also feels that there should be an improvement in joints, which will permit ready adjustment due to temperature changes in order to maintain more uniform expansion gaps and thus minimize the tendency to battered joints, which is accelerated by the softness of the rails, and which would affect their service life seriously if it were not for recent developments in building up battered rail ends by welding. In this connection, he refers to the interesting experimental work along these lines which has been carried on by Hunter McDonald, of the Nashville, Chattanooga & St. Louis. A. N. Reece, chief engineer of the Kansas City Southern, advises that his road is experimenting with longer joint bars in an effort to reduce the battering of rails.

Among those who feel that transverse fissures and other internal defects are among the greatest deficiencies are C. E. Weaver, chief engineer of the Central of Georgia; Mr. Geyer of the C. & O.; L. C. Hartley, chief engineer of the C. & E. I.; C. T. Dike, engineer of maintenance of the C. & N. W.; Mr. Clarke of the D. & H; Mr. Davis of the G. N.; Mr. Blaess, of the I. C.; Mr. Reece of the K. C. S.; James J. Burns, assistant engineer maintenance of way of the Louisville & Nashville; K. H. Hanger, engineer maintenance of way of the M.-K.-T.; H. A. Cassil, chief engineer of the P. M.; Col. F. G. Jonah, chief engineer of the Frisco, and R. H. Howard, chief engineer of the Wabash.

Other Objectionable Qualities

Aside from the features already cited, softness of the rail, resulting in rapid wear or flow of metal in the head, as well as battering and chipping, is mentioned as an objectionable quality in the present rails by G. W. Harris, chief engineer of the Santa Fe; Mr. Robinson of the B. R. & P.; Mr. Blaiklock of the Canadian Northern; Mr. Fairbairn of the Canadian Pacific; A. C. Shields, general manager of the Denver & Rio Grande Western; Mr. Reece of the K. C. S.; Mr. Hanger of the M.-K.-T.; Mr. Hadley of the Missouri Pacific; Mr. Bronson of the N. Y. C.; A. C. Harvey, chief engineer of the Nickel Plate, Mr. Cassil of the P. M.; Col. Jonah of the Frisco; W. D. Faucette, chief engineer of the Seaboard Air Line; Mr. Akers, of the Southern; R. W. Gaines, engineer maintenance of way of the T. & P.; C. R. Harding, engineer of standards of the Southern Pacific; Mr. Adams of the Union Pacific, and Mr. Howard of the Wabash.

Lack of uniformity of quality is an objection mentioned by Mr. Robinson of the B. R. & P.; Mr. Penfield, of the C. M. St. P. & P.; Mr. McDonald of the N. C. & St. L., and Mr. Faucette, of the S. A. L. On the other hand, Col. Jonah, of the Frisco, notes an improvement in this respect in the rails rolled in 1926 and 1927.

A. R. E. A. Specifications Are Widely Used

With respect to specifications, it is found that most of the larger roads are using those adopted by the A. R. E. A. in 1925, and feel that they have resulted in an improved quality of rail. The provision that all three test pieces must withstand the drop test, and the segregation and marking for identification of the A rails and those with high and low carbon content, are especially commended as contributing to safety and to greater service life. As a means of eliminating the disproportionately large number of rail failures from A rails, the Santa Fe, the Canadian National and the Great Northern have modified these specifications by the elimination of A rails entirely, taking in their stead an equivalent tonnage of tie plates rolled from that portion of the ingot from which the A rails would be obtained, while other roads contemplate adopting the same practice. It is the custom of numerous other roads to confine the use of A rails to lines of slow or light traffic, although some of the roads are experiencing difficulty in finding sufficient places of this character to provide for the tonnage of these rails which they receive. L. C. Hartley, chief engineer of the Chicago & Eastern Illinois, reports that since that road has few curves, it is possible to provide high carbon rail for practically all of them.

The Kansas City Southern specifies a desired maximum for sulphur content for the purpose of reducing segregation, and the Texas & Pacific is asking for a higher carbon content than formerly. The Southern Pacific adopted the 1925 A. R. E. A. specifications

because of their more exacting requirements, and also specifies the milling of the ends of the rails to provide a better finish and to permit a better inspection.

In 1927, the Canadian Pacific adopted specifications of its own, which were prepared in close co-operation with the Canadian rail manufacturers. These embody the nick and break test and this, together with the drop test provision, which is similar to that of the A. R. E. A., are said by Mr. Fairbairn to result in the acceptance of a maximum amount of sound steel and a maximum rejection of unsound metal.

Use of Intermediate Manganese Steel

The New York Central Lines use the Dudley specifications, which were prepared by the late Dr. P. H. Dudley in 1909, but which have been revised to provide for the separation and marking of A rails, and rails of high and low carbon content. A slight modification was made in the range of silicon, changing from the former limits of 0.10 to 0.20 to limits of 0.10 to 0.25. This road also has made greater use of medium or intermediate manganese rails, which give indications of being superior to standard open hearth rails on account of their greater toughness, finer grain structure, and greater freedom from rolling mill defects, resulting in greater resistance to wear and fewer rail failures. The chief engineer of an important western road reports that a large tonnage of intermediate manganese rail has been purchased by his road during the last two years, and that the tests made at the time of rolling, as well as the results obtained in service, appear very promising. Mr. Reece, of the K. C. S., advises that intermediate manganese rails, on curves of 3 deg. and over, have shown a longer life than open hearth rails laid in the same locations.

The Northern Pacific installed some Sandberg sorbitic rails on sharp curves in its mountain territory in 1924, and an inspection made three years later showed that the loss of metal by abrasion, as well as the flow of metal on the low side, had been considerably less than in the case of open hearth rails on similar curves carrying the same tonnage. The Kansas City Southern also reports similar results with the use of Sandberg sorbitic rails on curves of five degrees and over.

From the foregoing it is plain that both the weight and quality of rails are receiving their due share of attention and that there has been acceleration of interest in this respect in recent years. An encouraging feature is the study which is being devoted to the design of motive power, whereby heavier axle loadings, with consequent greater tractive power, are being secured with less punishment to the track than was inflicted by locomotives of older designs.

Turntable Renewed in 6½ Hours

SIX HOURS and twenty-five minutes was the time required to replace a turntable on the Chicago, Rock Island & Pacific at Trenton, Mo. The table released was 90 ft. long, while the new one is a 100-ft., three-point-bearing type furnished by the American Bridge Company and fabricated at its plant at Gary, Ind. The time could undoubtedly have been reduced appreciably but for the fact that it was necessary to cut down the concrete pedestal which had supported the old center, before the new center could be set. However, this work was expedited by using pneumatic hammers and by bolting the new center to a precast concrete block in advance, so that the block and the center were placed as a unit. The block was set on a ¾-in. bed of Lumnite cement mortar spread over the old concrete after it had been cut down.

Another measure that insured against unnecessary delays, was the assembly on car trucks, of the new table complete, including the ties, rails and walks, as well as the turning motors and the overhead arch for the current delivery. A temporary connection to the power supply was then made and the motors thoroughly tested.

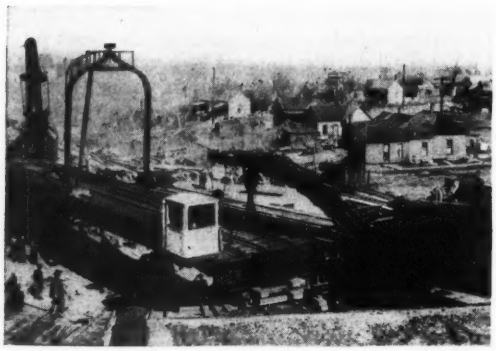
The change in the turntables was made on November 3, 1927, according to the following procedure:

All locomotives to be called within a period of seven hours were taken out of the roundhouse and turned early in the morning so that the old table could be released at 7 a. m. At that hour, a 60-ton wrecker, which had been run across the table and into the stall track opposite one of the lead tracks the night before, hauled the new table on to the old one by means of a cable.

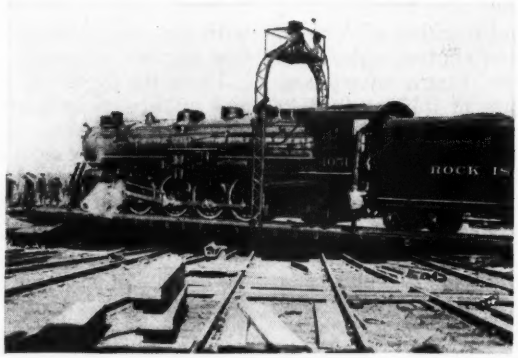
This wrecker and another at the other end, then picked up the new table and set it on blocking in the pit at one side of the old table. The old table, with the car trucks still on it, was then picked up by the two wreckers and set in the pit on the opposite side of the center from the temporary position of the new turntable. This operation gave access to the old center, which was lifted out, and a crew of men started work with five pneumatic hammers to cut down the pedestal the requisite amount.

Hauling the Old Turntable Away

While this work was in progress one of the two wreckers, a 100-ton self-propelled derrick, picked up a 30-ft. frame trestle which had previously been assembled complete with bents, deck and track, and set it in the pit between the turntables just inside the new circle wall on falsework piling, that had been cut off to exact height. This enabled the wrecker



Above—After the New Turntable Had Been Set to One Side, the Old One Was Lifted Off the Center and Set Down in a Position Opposite the New One

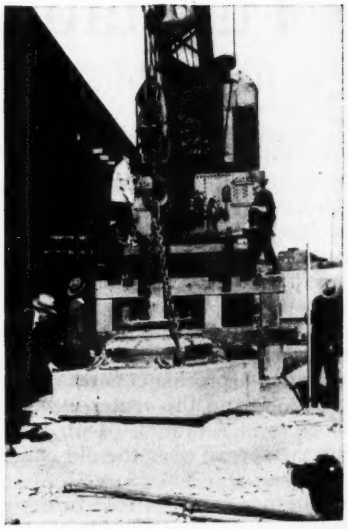


Above—The Center Having Been Placed in Position, the New Turntable Was Lifted from Its Temporary Position and Set in Place On the New Center

Above—Passenger Locomotive No. 4051 Was the First to Be Turned On the New Table

Left—After the Old Turntable Had Been Lifted Out of the Way, One of the Cranes Brought Up a Wooden Frame Trestle and Set It in the Pit

Right—With the Trestle in Place and Rails Connected, the Crane Proceeded Out On It with the Assembled Center Bearing and Bearing Block, and Set Them On the Footing



to move out over the pit with the precast center block and center bearing far enough to set the assembled unit in place on the bed of mortar provided for it.

This done, and the new center block anchored in place, the wrecker backed off the trestle, picked it up and set it out of the way, after which the two wreckers again took hitches on the new turntable and set it into position over the center. The two car trucks were then transferred from the track on the old table to that on the new, after which the old table was picked up and placed on these car trucks and moved off the new table out of the way.

By this time the connection had been made to the current supply and the table was given one complete turn under its own power as a test. Engine No. 4051, a Rock Island mountain-type passenger locomotive, was then run on the new table at 1:25 p. m. and turned. All of the work incident to the change of turntables was done by four bridge gangs and one section gang, with the co-operation of mechanical department forces.

We are indebted for the above information to W. J. McAdams, master carpenter, Missouri division, C. R. I. & P., Trenton, Mo.

On Time Record.—Since December 20, 1925, the Union Pacific has handled 8,000 fruit trains between Ogden, Utah, and Council Bluffs, Iowa, 993 miles, all of which arrived on time.

Relaying and Surfacing A Mile of Track a Day

C. & N. W. Reduces Labor Requirements and Expedites Work by Liberal Use of Mechanical Equipment

The Beginning and the End of the Power Tool Procession—Left, Spike Pullers—Below, the Tamping Machines.

THE Chicago & North Western, in its rail-relaying program on the stone-ballasted double track on its Galena division across Illinois, has co-ordinated its efforts so that from 5,000 to 6,000 ft. of track is relaid each day with 110-lb. rails, while an equal amount of track is raised and surfaced after the rail is laid, the two operations being so synchronized that the rail is subjected to traffic during only one night before the tie renewals are made and the track surfaced on well tamped ties. Apart from the saving in labor and the other advantages accruing from making one job of rail laying and surfacing, the practice is expected to protect the rails from injury and to lengthen their life materially. This achievement is made possible by equipping both the rail laying gang and the ballasting gang with mechanical equipment to perform almost all of the work by machinery, and by turning over the exclusive use of the track to these gangs during the working hours so that the operations may proceed unhampered by traffic.

Organization of the Rail Gang

The equipment and organization of the rail gang is, in general, similar to that used in the previous year, as described in the July, 1927, issue of *Railway Engineering & Maintenance*, page 288, with such modifications as were necessary to procure the desired results. The gang consists of from 65 to 75 men under the direction of a foreman and three assistant foremen, while the mechanical equipment comprises two Ingersoll-Rand air compressors operating Ingersoll-Rand spike pullers, spike drivers, bolters and air drills, one Cullen-Friestedt "steel burro" rail crane, and one push car carrying oxy-acetylene gas tanks for applying welded track bonds. The saving in labor is apparent when it is seen that one air compressor, operating four spike pullers and two bolters, with a crew totaling nine men, remove all of the old spikes and bolts for each day's work, while a second compressor, operating four spike drivers and two bolters, drives home all of the new spikes and runs up the nuts on the new bolts with a crew of seven men. The rail crane which sets in the new rail has a crew of four men. Thus all of the heavy work is performed by machines operated by three power units, with a total of 20 men, leaving from 45 to 55 men to throw out the old rail, adze the ties, drive the tie plugs, apply the tie plates and angle bars, start the spikes to be driven by the pneumatic spike drivers, apply anti-creepers and pick up the old material. The distribution of these men is varied from time to time, as conditions demand, in order that the work may proceed according to schedule, the foreman, with his three assistant foremen, being able to co-ordinate the work so that the necessary shifts may be made to the best advantage.

The Spike Drivers and the Compressor Which Served Them

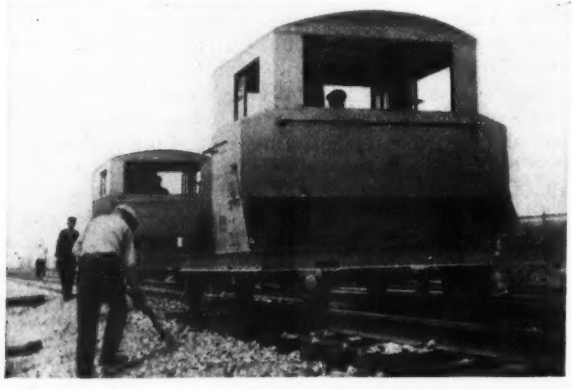
Sequence of Operations

The distribution of the mechanical equipment and the sequence of operations are as follows: In the lead, an eight-tamper compressor towed by a motor car, operates four spike pullers ahead of the compressor

and two bolters in the rear, the latter removing the nuts from the bolts in the old rail. The gang consists of a compressor operator who also runs the motor car, two men operating the bolters, four men operating the spike pullers, and two men to carry the air hose for the spike pullers to keep them from dragging on the ballast and also to lighten the load on the operators. The hose to the spike pullers are long enough to permit them to operate 50 ft. ahead

Signal Men Welded the Track Bonds to the Rails

of the compressor. Following the machine, laborers with mauls remove the old angle bars. The rails are then removed by two men who insert the sharp points of lining bars in bolt holes at opposite ends of the rail and tip it over, after which it is slid off the ends of the ties by taking "lifting holds" with the bars under the rail, one near each end. After the rails are removed, the ties are adzed, tie plugs driven in the old spike holes, and the tie plates placed on each tie to receive the new rails, which have been unloaded in the intertrack space and which are then set in place by the rail crane. This crane also picks



Requisite Progress Can Be Made with Two of the Power Ballasters

up the old rails which have been thrown to the outside of the track and places them in the intertrack space to be picked up later by the work train.

Following the rail crane, the angle bars are applied, the bolts inserted and the nuts started on the bolts by hand. The rail is gaged at proper intervals, and the other spikes are started into the ties by laborers with spike mauls. These men are followed by a self-propelled 12-tamper compressor, which operates four pneumatic spike drivers at one end of the machine and two pneumatic bolters at the other. This compressor is also provided with a pneumatic rail drill for use at turnouts or at other places where it may be necessary to drill bolt holes on account of cutting the rails. Bringing up the rear is a push car carrying gas tanks for oxy-acetylene welding of the copper track bonds, which are applied by men from the signal department. The bonding of all new rail is completed each day, so that the track circuits will function during the night when the track is given over to regular traffic.

The released materials, both usable and scrap, are picked up by a work train, the rails being loaded by a rail crane mounted on a flat car. In addition to these duties, the work train also distributes the ballast, which is received in center dump cars for filling in and dressing the track after it has been raised and surfaced.

Tamping Is Done by Machines

The surfacing gang consists of 150 men, in charge of a foreman and three assistant foremen, equipped with three Jackson power ballasters, each with four pairs of tamping shoes. In carrying on this work,

The Surfaced Track Immediately Behind the Ballasters

two men with jacks raise the track to grade stakes which are set to give a lift of about four inches. After the track is raised, the ties to be replaced are removed and the new ties inserted, the operation being expedited by the practice of having the rail gang drive only the outside spikes in the ties which are to be renewed. Other men of the gang shovel-tamp the ties sufficiently to hold the track to grade until the track ballasters reach the raised portion, while still others with ballast forks throw in ballast from the sides of the track where necessary to provide sufficient stone for tamping.

At the beginning of each day's work, after a section of track has been raised in this manner, the ballasters begin operation, one behind the other, within a distance of one to two rail lengths. Each machine strikes two blows of the shoes on the ballast in each crib, the action of the shoes driving the ballast under the adjacent ties, and as three machines are used, six blows in all are delivered to drive the ballast under each side of each tie, this number having been found sufficient to tamp the tie solidly. Besides cutting down the number of laborers that would be required for hand tamping, uniform tamping is secured.

While three ballasters have been used, experience has demonstrated that the requisite progress can be made with two machines, each striking three blows

The Men in the Ballasting Gang Were Carried to and from Work on Trailers Hauled by the Power Ballasters

on the ballast in each crib, thus securing the same tamping as when three machines deliver two blows each. The installation of the three machines in the first instance was to insure that the desired amount of track would be tamped each day, but careful attention to detail has since made it possible to reduce this equipment by one-third.

Following the machines, four men apply the new anti-creepers, and farther back, a small gang lines the track, after which ballast is unloaded from center-dump cars and the track is filled in and dressed. The gangs work 10 hours a day, the men preferring this on account of the larger earnings, while it is also advantageous to the railway by reason of the increased output. Owing to the use of machinery for the heavier tasks, there is not the letting down of progress toward the close of the day which is experienced when these operations are performed by manual labor.

The organization of the gangs and the equipment was worked out by C. T. Dike, engineer of maintenance of the Chicago & North Western, to whom, and to L. A. Clapp, division superintendent, we are indebted for information and for an opportunity to inspect the work.

Large Increase in Timber Treated

NOT ONLY was more timber treated in the United States during 1927 than in any previous year, but the increase over the previous year was 19.5 per cent, 345,685,804 cu. ft. of wood being subjected to preservative treatment in 1927 as compared with 289,322,079 cu. ft. in 1926. As in previous years, railroad cross ties made up the great bulk of the wood treated, representing 222,695,520 cu. ft. or nearly 65 per cent of the total. The past year was also a record year in so far as it concerned the treatment of cross ties. The number of ties, 74,231,840 being not only the largest number ever treated in any one year, but also representing an increase of 11,577,302 ties or 18.5 per cent as compared with 1926, which was the previous high record. These are the outstanding facts presented in the Statistics on Wood Preservation in the United States in 1927 prepared by R. K. Helphenstine, Jr., for the Forest service of the United States Department of Agriculture, in co-operation with the American Wood Preservers Association.

More Poles and Construction Timbers Treated

In these statistics, which have been compiled annually beginning with 1909, woods subject to preservative treatment are divided into seven classifications by use, of which cross ties constitute by far the most important class. The two classes next in importance, poles and construction timbers, were also represented in 1927 by record quantities of wood treated, poles with 64,028,607 cu. ft. as compared with 49,511,089 cu. ft. in 1926 and construction timbers with 32,544,996 cu. ft. as compared with 31,147,287 cu. ft. In the case of the fourth classification in the order of magnitude, namely that of piles, the number of cubic feet treated in 1927 was 11,660,322 which represents a decrease of 760,555 cu. ft. as compared with 1926. There was an increase in the case of wood blocks from 3,689,424 cu. ft. in 1926 to 5,271,420 cu. ft. in 1927, but in spite of an increase in the treatment of wood blocks during the last three years, the total for 1927 stands far short of the 10,145,724 cu. ft. treated in 1911. The treatment of cross arms, 1,008,192 cu. ft. in 1927, was nearly one fifth less than the total for 1926. It is in the case of miscellaneous materials that the largest proportionate increase took place in 1927, 8,476,747 cu. ft. of miscellaneous wood products being treated in that year as compared with 3,245,283 cu. ft. in 1926.

Large Increase in the Use of Domestic Creosote

With a large increase in the volume of timber subject to preservative treatment it follows that there was a corresponding increase in the consumption of preservatives. However, this increase was almost entirely in creosote, of which 219,778,430 gal. was used as compared with 185,733,180 gal. in 1926. Furthermore, the increase in the use of creosote oil was entirely in the consumption of domestic creosote oil, 128,716,921 gal. being used in 1927 as compared with 90,290,066 gal. in 1926. On the other hand, the use of imported creosote totaled 91,061,509 gal., a reduction from 95,443,114 gal. in 1926. The consumption of zinc chloride showed a further decline, totaling 22,162,718 lb. as compared with 24,777,020 lb. in 1926 and 51,375,360 lb. in the record year of 1921. Petroleum oil, which is having increased use as an admixture with creosote in the treatment of ties during the last five years, was used in 1927 to the extent of 22,911,134 gal. as compared with 13,317,022 gal. in

Wood Preservation, 1909-1927, Together With Consumption of Creosote and Zinc Chloride

Year	Total Material Treated Cu. Ft.	Number of Cross Ties Treated	Creosote Used, Gal.	Zinc Chloride Used, Lbs.
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,888	40,260,416	108,378,359	26,466,803
1914	159,582,639	43,846,987	79,334,606	27,212,259
1915	140,858,963	37,085,585	80,859,442	33,269,604
1916	150,522,982	37,469,368	90,404,749	26,746,577
1917	137,338,586	33,459,470	75,541,737	26,444,689
1918	122,612,890	30,609,209	52,776,386	31,101,111
1919	146,060,994	37,567,927	65,556,247	43,483,134
1920	173,309,505	44,987,532	68,757,508	49,717,929
1921	201,643,228	55,383,515	76,513,279	51,375,360
1922	166,620,347	41,316,474	86,321,389	29,868,639
1923	224,375,468	53,610,175	127,417,305	28,830,817
1924	268,583,235	62,632,710	157,305,358	33,208,675
1925	274,474,538	62,563,911	167,642,790	26,378,658
1926	289,322,079	62,654,538	185,733,180	24,777,020
1927	345,685,804	74,231,840	219,778,430	22,162,718

1926. The consumption of miscellaneous preservatives totaled 631,234 gal. in 1927 as compared with 259,961 gal. in 1926.

Preservation of Cross Ties

Of the cross ties treated during the year covered by this report 45,177,218 were hewed and 29,054,622 were sawed. Oak and yellow pine ties again ranked first and second respectively from the standpoint of the number treated in 1927. The number of oak ties subjected to treatment during that year was 27,458,572 or 37 per cent of the total number reported, while for yellow pine the number impregnated with preservatives was 20,965,509, or 28.2 per cent of the total. Douglas fir ties occupied third place with a total of 5,887,619 or 7.9 per cent, and gum ties were fourth with 5,399,199 or 7.3 per cent. Of the total number of ties treated, all but 1,197,431 were intended for use by steam railroads.

The quantity of piles subjected to treatment in 1927 was 17,241,345 lin. ft., or 1,124,730 lin. ft. less than reported in 1926. Of the total quantity of this class of material that was impregnated with preservatives 13,359,652 lin. ft. or 77 per cent were of southern pine. Douglas fir ranked second with 2,901,982 lin. ft. or 16 per cent. Oak was third with 493,788 lin. ft., and cypress, cedar, tamarack and lodgepole pine came next in the order named.

Preservatives Used and Material Treated in the United States, 1926-1927

Number of plants in operation, Preservatives used, and Material treated		1926	1927
Number of Plants in active operation		180	187
Preservatives used—			
Creosote			
Domestic (1)	(Gallons)	90,290,066	128,716,921
Imported	(Gallons)	95,443,114	91,061,509
Total creosote	(Gallons)	185,733,180	219,778,430
Petroleum	(Gallons)	13,317,022	22,911,134
Paving oil	(Gallons)	2,541,563	1,389,465
Zinc Chloride	(Pounds)	24,777,020	22,162,718
Misc. Preservatives	(Gallons)	259,961	631,234
Material treated—			
Crossties			
Hewed	(Number)	37,429,092	45,177,218
Sawed	(Number)	25,225,446	29,054,622
Total crossties	(Number)	62,654,538	74,231,840
Piles	(Lin. ft.)	18,366,075	17,241,345
Poles	(Number)	2,813,130	3,637,989
Wood blocks	(Sq. yds.)	1,405,495	2,008,160
Construction timbers	(Bd. ft.)	373,767,441	390,539,947
Cross arms	(Number)	2,169,097	1,626,641
Miscellaneous	(Bd. ft.)	38,943,397	101,720,964

(1) Includes distillate coal-tar creosote, creosote coal-tar solution, refined water-gas tar and water-gas tar solution.

Preservation of Poles

In 1927 a total of 3,637,989 poles were subjected to preservative treatment. This constitutes an increase of 824,859 over the 2,813,130 that were given treatment in 1926. Southern pine poles stood at the head of the list in point of number treated, with a total of 1,738,839, or nearly half the total quantity reported. Western red cedar poles came next with a total of 1,112,500, while northern white cedar with 431,744 and chestnut with 324,248 ranked third and fourth respectively.

Of the total of 3,637,898 poles that were given preservative treatment 1,749,682 were pressure treated for their entire length and 1,888,307 were butt treated only. All but 10,843 of the poles that were pressure treated were of southern yellow pine. Of those that were given butt treatment, western red cedar headed the list with 1,112,500, northern white cedar was second with 431,744 and chestnut third with 324,248.

The two classifications, construction timbers and miscellaneous materials, contain several items of interest to railroad men. In the case of construction timbers, the two most important items are switch ties and bridge timbers, a total of 182,411,211 ft. b.m. in switch ties being treated in 1927 as compared with 158,128,637 ft. b.m. in 1926. Figures for bridge timbers, lumber, fence posts, tie plugs, crossing plank, switch ties and car material are given in the subjoined table.

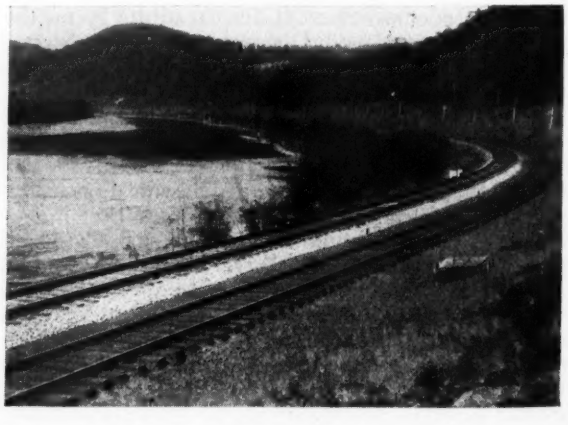
Crossties Treated by Kinds of Wood and Kinds of Preservatives—1927

Kinds of wood	Treated with creosote (1)	Treated with creosote-petroleum (2)	Treated with zinc-creosote (3)	Treated with zinc-chloride	Treated with miscellaneous preservatives	Total	Per cent of total
	No.	No.	No.	No.	No.	No.	
Oak	21,467,239	1,476,678	1,954,721	2,559,934	.....	27,458,572	37.0
Yellow pine	14,020,828	5,457,271	430,404	1,057,006	.....	20,965,509	28.3
Douglas fir	80,834	4,442,015	53,602	1,281,168	30,000	5,887,619	7.9
Gum	3,790,881	1,123,996	194,297	290,025	.....	5,399,199	7.2
Beech	1,494,203	320,741	244,945	748,366	.....	2,808,255	3.8
Maple	1,419,133	477,092	105,608	686,982	.....	2,688,815	3.6
Lodgepole pine	95,000	236,184	.....	2,185,909	.....	2,517,093	3.4
Birch	730,331	1,027,434	200,608	392,188	.....	2,350,561	3.2
Western yellow pine	340	653,321	431,239	367,558	.....	1,452,458	2.0
Hemlock	997	18,592	.....	722,828	.....	742,417	1.0
Tamarack	9,712	464,879	.....	211,189	.....	685,780	.9
Elm	319,442	40,610	677	119,224	.....	479,953	.6
All other	384,957	52,334	100,895	257,423	.....	795,609	1.1
Total	43,813,897	15,791,147	3,716,996	10,879,800	30,000	74,231,840	100.
Per cent of total	59.02	21.27	5.01	14.66	.04		100.

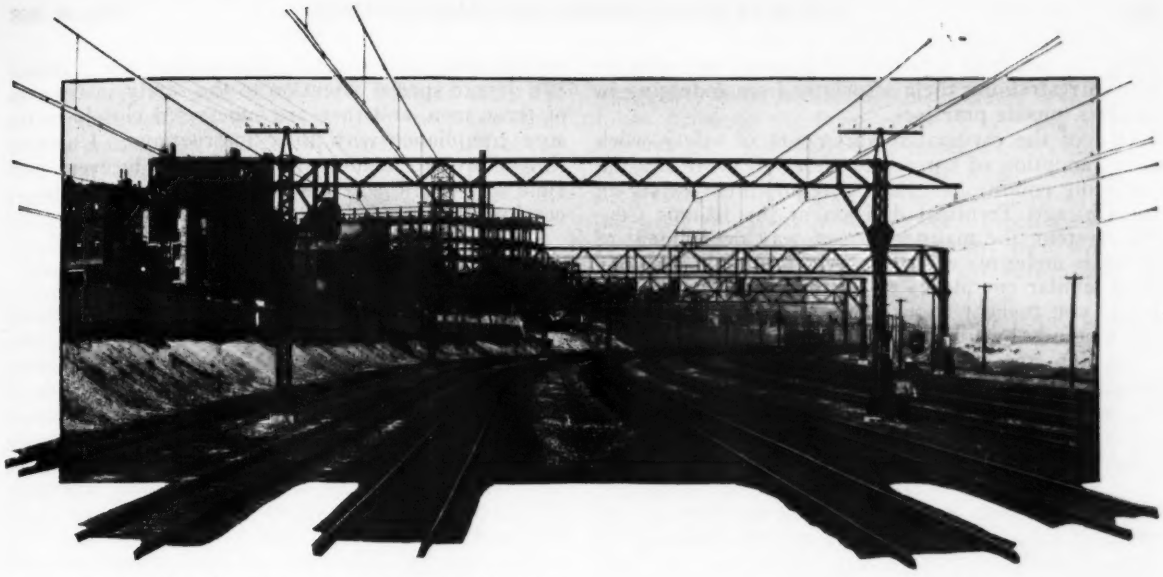
(1) Includes distillate coal-tar creosote, creosote coal-tar solution, refined water-gas tar and water-gas tar solution.
(2) Includes distillate coal-tar creosote, creosote coal-tar solution, refined water-gas tar and water-gas tar solution in mixture with petroleum.
(3) Includes distillate coal-tar creosote, creosote coal-tar solution, refined water-gas tar and water-gas tar solution in mixture with zinc chloride.

	1926 ft. b.m.	1927 ft. b.m.
Lumber	12,255,609	53,567,458
Fence posts	6,742,132	23,439,193
Tie plugs	2,664,459	2,045,765
Car material	2,954,088	1,778,928
Crossing plank	286,008	419,541
Switch ties	158,128,637	182,411,211
Bridge timbers		128,290,660

The growth of the wood preservation industry is also indicated by the fact that seven more wood preserving plants were in operation during 1927 than in 1926, the total number of plants active in 1927 being 187. Ten new plants were constructed during the past year. Of the total number of plants that were in active operation during 1927, 117 were pressure cylinder plants, 56 were non-pressure (open tank) plants and 14 were plants maintaining both pressure and non-pressure equipment. Only 33 of the plants are owned and operated by railroads.



On the Erie Along the Delaware River



Over 700 Trains Move Over These Tracks Every Week-day

Avoiding Accidents in One of the Country's Busiest Terminals*

Systematic Training, Supplemented by Close Supervision, Has Reduced Injuries on the Illinois Central

By J. J. DESMOND

Roadmaster, Chicago Terminal Division, Illinois Central

THE temptation to take a chance is always present, and human nature is prone to forget the teachings of caution. Success in safety work can be attained only by taking account of this trait of human nature and doing one's best to overcome it by constant reminders. That means that we must continue to keep the need for the observance of safety precautions uppermost in the mind of every member of the maintenance of way organization.

Good results in safety work cannot be achieved merely by passing out books of rules and regulations, with instructions that they be read by all concerned, and thereafter taking it for granted that everything in the books will be observed strictly. According to my experience, safety work that accomplishes its purpose calls for the exercise of unremitting thought, diligence and hearty co-operation all along the line.

Must Reach the Individual Worker

Supervising officers should be thoroughly impressed with the knowledge that they have no more important duty than to teach safety constantly by word and example to the men under their charge, and to see that their teachings are put into practice. In the final analysis, however, the urge to practice safety that gets results comes from within and not from without the individual. No set of instructions can possibly be framed to cover all of the contingencies that may arise in railway maintenance work. Certain general instructions covering situations encountered frequently can be, and, of course, should be given, but in the main the prevention of accidents is a matter of initiative, training and good judgment on the part of the individual worker. Not even the most careful supervision can completely take the place of these qualities, although it is immensely valuable in developing and supplementing them. Consequently, no effort should be spared to enlist the hearty interest and co-operation of the men in practicing safety at all times, both in the interest of themselves and their families, as well as a matter of duty to their fellow workers and their employers.

Training of New Employees

It is highly important to give special attention to the safety training of new employees. Many men entering the maintenance of way organization have little or no idea of their duties and the ways to avoid the hazards of accident connected with their work. By kindly, careful instruction and close supervision at the outset of their employment, they can be so thoroughly grounded in the practice of safety as to make it unlikely that they will indulge in hazardous practices when they become more experienced. Good habits are as easily formed as bad habits. By taking advantage of this principle in the training of new employees, it is not hard to build up an organization in which safe workers predominate greatly. Such an organization is doubly effective in the prevention of accidents, because the men not only safeguard themselves and set a good example for others, but they

*Abstracted from a paper presented at the eighth annual meeting of the Safety Section of the American Railway Association at Buffalo, N. Y., on May 16.

bring the powerful influence of general sentiment to bear in restraining their associates from indulging in reckless, unsafe practices.

One of the cardinal requirements of safety work is the adoption of special measures to meet unusual operating conditions. Such a requirement exists on the Chicago Terminal division of the Illinois Central System, the maintenance of way department of which is under my direction. Since some of you may have similar conditions to contend with, it may interest you to hear about some of our problems and the methods by which we strive to overcome them.

Besides the exceedingly heavy movement of freight, through passenger and switching traffic to be expected on an important terminal such as ours at Chicago, the Illinois Central operates an extensive suburban service to and from downtown Chicago. This service was recently electrified, and large increases have been made in both the number and the speed of suburban trains. The unusual safety problems of maintenance of way work, therefore, are greatly intensified in our case by an unusually heavy traffic density. To give you an idea of this density, approximately 700 through and suburban passenger trains are handled every week-day over the tracks in the vicinity of our Central station, in addition to numerous freight and switching movements. The suburban traffic alone, during its morning and afternoon peak periods, averages about eighty trains an hour.

Suburban Traffic Imposes Limitations

You can readily appreciate that track work on the portion of the terminal where the traffic is heaviest must be performed under exceedingly difficult conditions, especially from the standpoint of safety. The difficulty is magnified by the fact that, except in emergencies, we have at best only about five hours a day in which to work. That is because of the limitations imposed by the suburban rush-hour periods, during which work on the suburban tracks is suspended, as a rule. We have to work fast and at the same time keep out of the way of trains. There is no time or opportunity to receive warning of train movements from the dispatchers, so the foremen and their assistants have the entire responsibility—and it is a heavy one—of protecting their men from injury by trains. This means that they have to be thoroughly familiar with the time card and, in addition to their other duties, must keep a constant lookout to see that the men receive warning of approaching trains in ample time to get in the clear.

On this part of the terminal we have an average of ten main tracks, of which six are suburban tracks. The distance between tracks averages 14 ft., center to center. The six suburban tracks are grouped, northbound trains using three adjacent tracks and southbound trains the other three.

Several Trains May Approach at Once

Not infrequently trains on three or more tracks are approaching simultaneously a point where men are at work, and sometimes all ten of the tracks are occupied in the vicinity at the same time. It is obvious that a high degree of alertness and good judgment is required to get the men in the clear under such conditions. Failure to move promptly and in the right direction means grave likelihood of stepping from the path of one train into the path of another.

Our practice is to assign our most experienced and careful men to the work on this part of the terminal. We devote special attention to the safety instruction of these men, and they are supervised closely to insure compliance with their instructions. Unremitting efforts are made to impress them in every possible way with the necessity for exercising the utmost caution at all times.

Code of Whistle Signals by Foremen Warn the Men

It is the special duty of the foremen to instruct their men when and where to move to avoid oncoming trains. The foremen are provided with whistles which have a loud, distinctive sound, and a code of whistle signals has been adopted for the guidance of the men. The men are trained to listen sharply for these signals and to obey them instantly, all the men moving together in the designated direction. We have found this system of whistle signals to be extremely efficient and helpful, and it is used on the entire terminal. Its efficacy in conjunction with other safety measures is evidenced by the fact that during the year ending on April 1, 1928, we had only three accidents on the terminal, none of them fatal, resulting from track workers being struck by trains.

Electric operation of our suburban service also imposes special safety requirements. The maintenance of the overhead power transmission system, which carries 1,500 volts direct current, was placed under my direction in the summer of 1926. In organizing a force to carry on this work, we were able to obtain few men who were familiar with the system. It was necessary, therefore, to train this force in the observance of the required safety precautions. Special care and effort were devoted to this training. At the same time, thorough instruction was given the roadway maintenance and construction forces in the proper handling of pile-drivers, derricks, ditchers and similar equipment in the vicinity of the power lines. All work on and around the power lines is closely supervised at all times. As a result, since the beginning of electric operation, we have had no fatalities from electric shock and only four injuries of more than trivial consequence, none of which resulted in permanent disability.

Special Equipment for Electrical Workers

Most of our electrical maintenance work has to be carried on while the lines are energized, in order to avoid interruptions to the suburban service. That calls for considerable skill and close attention to details of equipment. Our men are provided with every needed kind of modern safety equipment for this work, including rubber gloves in suitable carriers, rubber blankets, line hose, insulator hoods, rubber matting and insulated ladders. All men in the electrical department are required to practice the administration of artificial respiration once a month under a capable instructor. We use the Shaffer prone-pressure method of resuscitation.

In one case in particular, this instruction in resuscitation was unquestionably the means of saving a man's life, when an electrician received a severe shock while working in proximity to a grounded structure and fell 16 ft. to the ground. When reached, he showed no signs of life. Without even waiting to move the man to a more convenient location, one of his fellow-workers started artificial respiration. In a few minutes, a passing train was flagged and the injured man was quickly transferred to the baggage car, where artificial respiration was immediately

resumed, the interruption being only for a matter of seconds. Approximately ten minutes after the accident, the efforts of the workers were rewarded by the resumption of natural breathing. Although the man required subsequent hospital treatment, there is no doubt but that he would have lost his life except for the prompt, intelligent action of his associates.

Besides the lessons given to electrical workers, instructions for resuscitation are published in all terminal time-cards. We also give class instruction in artificial respiration to all members of the maintenance of way department on the terminal, whether connected directly with electrical work or not, so that they can be of assistance in cases where resuscitation is necessary. This instruction is conducted by assembling the men in groups at some convenient point and giving demonstrations of artificial respiration. Attendance at the classes is obligatory for all employees.

Other measures used to teach safety include month safety meetings, which are attended in rotation by the foreman and one or two men of every gang. At these meetings, all accidents which have taken place on the terminal since the last meeting are thoroughly discussed. Attention is drawn to the violations of safety instructions which resulted in each accident and we stress the importance of avoiding such violations in the future. Meetings of this kind do a great deal to impress the men with the necessity for observing safety precautions at all times.

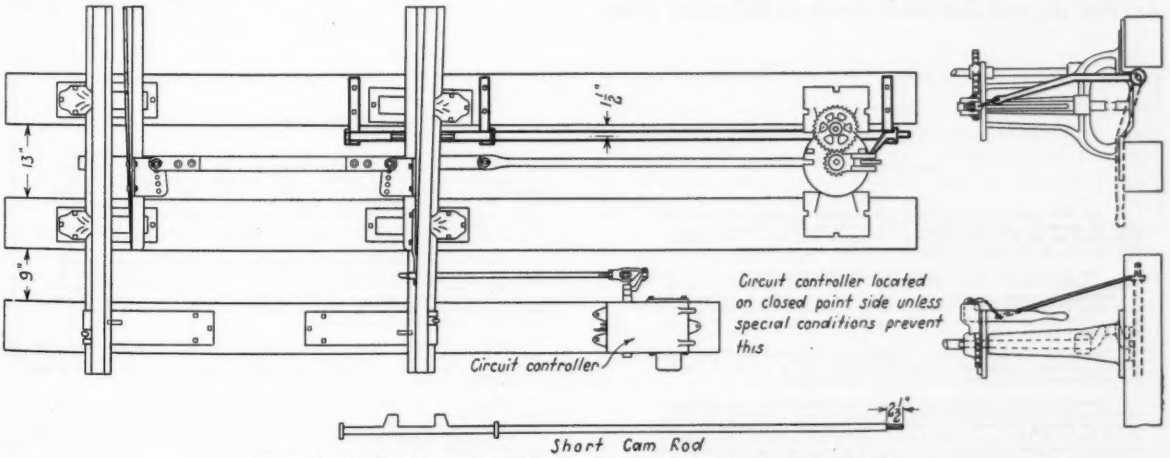
The primary aim of our safety work is to inculcate the lesson that "taking a chance" never pays in the long run. The chance-taker sometimes may save a little time or may conserve a little energy, and he may think that thereby he has gained in efficiency. But over a long period, the total gains are relatively small, and when his chance-taking leads to an accident, as it almost inevitably will in time, the cost in human happiness, or, perhaps in human life, will far outweigh the value of such gains. Our constant effort is to teach our men that it is never efficient or worth-while to take a needless risk.

Protecting Facing Point Switches

TRAIN accidents at facing point switches, occasioned by damage to the switch stand or the failure of the connecting rod, are not frequent, but when they occur the consequences are often serious. For this reason a number of roads avoid the use of uninterlocked facing point switches to as great an extent as practicable on multiple main tracks. On a single-track line, however, all main-track turnouts are facing point for trains in one direction or the other and the same is true on multiple tracks where the practice of running occasional trains "against the current" is in vogue.

To provide a safeguard against this class of accidents, where such protection is deemed advisable, the Chicago, Milwaukee, St. Paul & Pacific has devised and makes in its own shops a device which it terms a "cam lock" to hold the switch point in its normal position for main track movements, independently of the switch stand or connecting rod. This is accomplished by a 1½ in. rod extending from the switch stand to a point where a pair of lugs, near the end of the rod, will engage the outer edge of the base of the main rail and the inner edge of the base of the switch point when the switch is in position for main track movements, the rod making a quarter turn which causes the lugs to clear the rails, when the switch is set for the siding. The rod is supported by strap hangers spiked to the ties, which are so spaced with reference to collars on the rod that endwise movement of the rod is prevented. The space between the side of the rod and the side of the headblock is ¾ in.

The end of the rod near the switch stand terminates in a projection 1 in. square and 2½ in. long, over which the socket end of a lever is slipped and secured by a cotter key. The lever has a chain ring at its outer end to which the chain of the switch lock is attached and is of such length that when the switch stand is locked for main track movements the lever is nearly vertical, bringing the lugs into position where they engage the bases of the main rail and the switch point. When the stand is unlocked to be set



Cam Lock Used on the Chicago, Milwaukee, St. Paul & Pacific

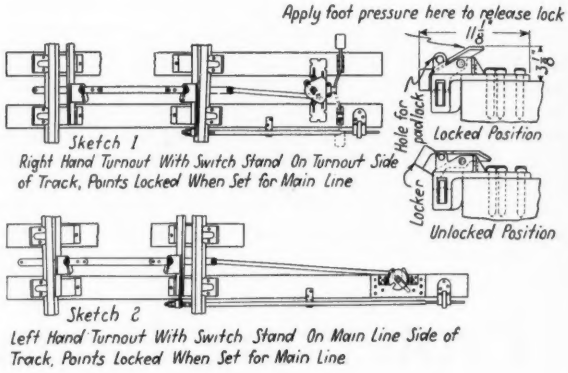
for the sidetrack, the lever falls forward by its own weight, turning the rod so that the lugs will not prevent the opening of the switch point.

As will be seen from this description, this device insures that the switch point fits snugly against the stock rail, since its failure to do so would prevent the raising of the lugs and this in turn would prevent the raising of the lever to permit the locking of the stand. In the event the switch stand is knocked down by some object on a train making a facing point movement the point is still secured, since the lever will be bent in the direction the train is moving and the turning of the rod in that direction is prevented by the lugs coming in contact with the switch tie.

The rods are made in two lengths, so that they may be used with the switch stand on either side of the track. The long rods are insulated when used in electric signal territory.

Another device for the same purpose but of a different design, which operates entirely independent of the switch stand, is known as the "PMCo" safety switch point lock. This assembly consists of a rod, one end of which is threaded to permit its being attached to a switch point lug, while the other end is drawn to a rectangular section, with a slot on the upper side about nine inches from the end. The rod extends from the switch point to a point near the switch stand, lying close to the side of and just below the top of the head-block, and passes through a casting attached to the headblock by lag screws. The portion of the casting through which the rod passes is divided into two parts, with parallel vertical faces to permit the operation of the "locker," which is pivoted on the upper part of the base of the casting so that its weight causes it to fall through the space between the lugs through which the rod passes. The width of the locker is slightly less than the width of the slot in the rod and the casting is placed so that when the switch is closed the locker will enter the slot, thus preventing endwise movement of the rod and holding the switch point firmly in place regardless of the connecting rod or switch stand. When it is desired to open the switch the locker is lifted from the slot by placing a foot on a pedal at the extremity of the locker while the switch is being thrown. When the pressure is released the locker descends on the full section of the rod and remains in that position until the switch is closed, when it drops into the slot automatically.

A lug with a hole for a switch lock is so located on the casting that the lock cannot be inserted until the locker is in position in the slot, and from which



"PMCo." Safety Switch Point Lock

the locker cannot be raised until the switch lock has been removed. This provides protection at all times since the switch lock cannot be applied unless the point is closed tightly and the locker cannot be raised, either by accident or design, without first removing the switch lock. This arrangement also eliminates the necessity of locking the switch stand.

This switch point lock is manufactured by the Pettibone Mulliken Company, Chicago, and can be applied with any kind of switch stand, whether located on the turnout side or the opposite side of the track.

Make it Work

You have heard the story about the argument regarding who was the greatest inventor; one man thought Edison was, another thought it was Henry Ford and so on until they came to the Jew who was of the opinion that the fellow who invented compound interest was no slouch.

Our lesson today is not about compound interest but it bears on a similar proposition. A man likes to have a little money in the bank in his checking account, but when he gets more on hand than is necessary to take care of his ordinary requirements, he draws it out and puts it to work. Only the money that works for us, does us any good in the way of making more money.

So it is with our material. Material is money, it costs real hard cash to purchase, it probably costs more in the way of accidents, excessive maintenance, etc., when it is needed and not used.

Here are a few of the cases of material misused that are actually occurring on the Northern division where the misuse is costing us money, either as a result of waste or improper application: Good ties scattered on the right of way and allowed to lay out for months until they start to rot; good ties used for supporting rail, etc., around the tool house - we should use second hand ties; tie plates used under continuous joints; rail anchors not against the ties; farm gates left in after private crossings have been abandoned; second hand crossing planks laying in some fence corner when they could be used to plank private crossings; car springs and oil box lids left on the right of way where they have fallen from passing trains; and you can probably think of many others.

Let's not order material until we need it and then when we get it put it to work; if we have material on hand that we cannot use, ship it to someone who needs it or to the store room. Remember, the fellow who invented compound interest was no slouch.

Trading Horses

David Harum was a foxy old Yankee horse trader whose motto was "Do unto the other fellow as he would do unto you and do it first." That was the way a good many people handled their business transactions 30 or 40 years ago; it may be a good plan to follow now in trading horses - or Ford cars. But the great majority of people today do their business on a higher plane; their motto is, "Honesty is the best policy" and they act on this, not for any sentimental reasons particularly, but because they know that following such a plan builds up their business and pays dividends.

Large business corporations consider as one of their biggest assets, what they call "good-will" and when a business changes hands the purchaser often pays more for this so-called "good-will" than for the physical assets of the company. Very evidently this "good-will" could not remain an asset, much less be increased if the firm in question was to use horse trading tactics in conducting its business.

We are not in the horse trading business, but some of us are using horse trading tactics in our railroading, and as a result we are not doing much to increase our "good-will". Where this condition prevails, stock in "Ourselves, incorporated" is considerably below par.

We may beat our company either intentionally or unintentionally; the result is the same. Of course the fellow who sins through ignorance will not have as many things to answer for in the next world, as the man who pulls the crooked stuff with his eyes open. But let's forget the moral question, and just figure this out as a cold blooded business proposition.

It is not hard for a gang to waste five percent of their time; fifteen minutes puttering around the tool house in the morning and running in ten minutes early in the evening will do it. And five percent on our railroad is the difference between make and break. Watch yourself someday and see how much time you waste in useless moves, lack of fore-thought and general cussedness. You will be surprised. And when you multiply this by twenty-five or thirty thousand - the other fellow has just as much right to be ornery and inefficient as you have - you will wonder how the railroad can make expenses.

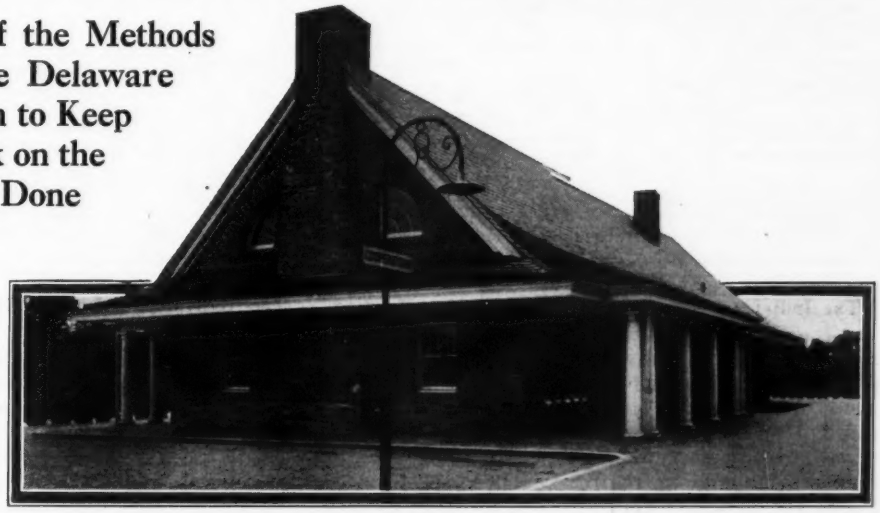
It is your railroad; you will probably be here long after most of the officers are gone; your welfare and that of your family depends on the prosperity of the railroad. Let's make it the best ever. To do this, the first thing we must do is to quit trading horses with our job.

How One Division Engineer Talks with His Men

Bulletins like these are sent monthly to all foremen and men on the Northern division of the Frisco

How Are Your Painting Records?

An Account of the Methods Used on the Delaware & Hudson to Keep a Check on the Work Done



A Stone Masonry Station Made Attractive by Its Neat White Trim

WHERE DO we stand on our maintenance painting? What must be done this year? How many men will we need? What quality of paint have we been using, and how is it standing up? These and many similar questions relative to bridge and building painting are raised at least annually on every road and often more frequently. This leads to the pertinent question—how many roads can answer these questions intelligently and accurately, and with a desirable degree of facility? No doubt there are a number of roads that can qualify in this respect to some extent, and at least a few roads which know exactly where they stand in answer to every question relative to their painting work. A road which belongs in this latter group is the Delaware & Hudson, which revised its methods of keeping maintenance painting records a few years ago and established a system which is accurate, thorough and efficient, and at the same time comparatively simple.

The effectiveness of the manner in which the D. & H. carries out its maintenance painting may be attributed to three principal practices. In the first place it divides its painting work into two distinct classes, building painting and bridge painting, placing every structure on the railroad which is protected by paint in one or the other of these two classes, and maintaining a separate set of records for each class. In the second place, it programs its painting work in advance, and in the third place, it keeps an accurate check on the work that is done and the results which are accomplished.

Building Painting Is on Five-Year Basis

All building painting on the D. & H. is based on a five-year program, through which it is the plan to paint every building on the road at least once every five years. Following this practice, the entire building painting work of the road is reprogrammed every five years, in each case about one year before the program in effect runs out. This results in always having on hand the painting program of the road at least one year in advance.

In mapping out the program, each division engineer, in conjunction with the division bridge and building master, prepares a list of all buildings on his division, in station order, this list including, beside buildings, all other wooden structures which can properly be classed with building work. After the name of each structure, under an appropriate head, is inserted its interior painted area, its exterior painted area, and the total painted area of the structure, including its roof, if the roof is subject to painting.

Following the actual painted areas of each structure, there is a column in which the trim and special painted areas of each structure, requiring a greater amount of time to paint, have been reduced to an equivalent flat area, and in this column the total painted area of the structure is expressed in terms of square feet of flat surface. By reducing all painted areas to this common basis, the total flat area on the division is ascertained, and by dividing this total by five, there is secured the theoretical area to be painted each year on the division in order to maintain a balanced five-year program. Knowing this latter area, the buildings of the division are lined up for painting under the proper year in the program, figuring from the date they were last painted, until in each of the five years the total surface area to be painted approximates as closely as possible one-fifth of the total painted building area of the division.

Owing to the plan followed in drawing up the first five-year painting program, the buildings to be painted in any particular year are in general grouped together on each of the divisions, an arrangement which not only precludes unnecessary shifting of the painting gangs from one end of the division to the other, but which also gives some uniformity to the painted appearance of the buildings. When the painting programs covering the various divisions have been prepared as described, they are submitted to the engineer maintenance of way for approval, and when approved, are put into effect.

While maintenance painting on the D. & H. is under the general supervision of the engineer maintenance of way, the carrying out of the program on each division is to a large extent a division problem. In other words, each division decides for itself the order in which its work is to be done, and any special

RECORD OF BRIDGE PAINTING — FORM 3654

Plattsburg N.Y. Date Dec.-31-1927

Bridge No 158.93 Division Champlain Branch Main line

Location Valcour

Style of Structure 1 Span girder - stone abutments

Date Painted form Nov.-1-1927 To Dec.-17-1927

Painted by Gang #1 Foreman James Whalen

Number of Coats Two Grand Total Cost $885.20

First Coat, Kind of Paint Graphite Gallons Used 12 Cost $20.70

Second Coat, Kind of Paint " Gallons Used 24 Cost $51.40

Spots painted with red lead 2 gals. Material, Total Cost $72.34

Labor Cleaning, Hours, Men Foreman Cost $50.78

Labor Painting, Hours, Men Foreman Cost $157.08

Labor, Total Cost $207.86

Condition of Structure Before Painting Considerable scale and rust on bottom chord

Weather Conditions Good

This Report must be sent in promptly on completion of job to Division Engineer

The Individual Job Card Record for Bridge Painting

THE DELAWARE AND HUDSON COMPANY — FORM 3144

BUILDING PAINTING RECORD

LOCATION Port Henry STRUCTURE Pump house DIVISION Champlain

DATE STARTED Oct-4-1927 DATE COMPLETED Oct.-12-1927 CONDITION OF OLD PAINT New work

TOTAL SQUARE FEET OF SURFACE OF BUILDING REQUIRING PAINTING

		SQ FT AREA	GAL OF PAINT	COLOR OF PAINT	MAKER OF PAINT	COST PER GAL	COST OF MISCL MATERIAL	TOTAL COST OF MATERIAL	COST PAINTER LABOR	COST OF CLEANING	TOTAL COST
OUTSIDE 1ST COAT	BODY	588	1 1/2	Grey	DePaCo	2.158	3.23				
	CANOPY	196	3/8	Green	B.P.S.	2.207	0.83				
	BELTCOURSE TRIM	"	1 1/4	Grey	DePaCo	2.158	2.70				
OUTSIDE 2ND COAT	BODY CANOPY WAINSCOT TRIM	"	3/8	Green	B.P.S.	2.207	0.83				
INSIDE 1ST COAT	BODY	442	2 5/8	Grey	"	1.956	5.13				
	CANOPY	250	1 1/2	Ivory	"	1.956	2.93				
	WAINSCOT TRIM	234									
INSIDE 2ND COAT	BODY	"	2 3/8	Grey	"	1.956	4.65				
	CANOPY	"	1 1/4	Ivory	"	1.956	2.45				
	WAINSCOT TRIM	"	1/4	Wh.Shellac		3.05	0.76				
ROOF	1ST COAT	250	3	Blk.Jones		0.437	1.31				
	2ND COAT			Stop Leak							
TOTALS		1960						24.82	46.10		70.92

REMARKS ON OPPOSITE SIDE CORRECT Edward Meyers FOREMAN

The Individual Job Card Record for Building Painting

organization of forces which may be required. This practice is possible and is carried out with the assurance of uniformity in the results accomplished through system detailed specifications and instructions governing every phase of building painting that is to be done on the road. These specifications are in the hands of all concerned on each division, and through them there is assurance that every structure on the road will be painted in accordance with standard practice.

A Record Is Kept of Each Painting Job

The five-year program of the D. & H. in handling its maintenance painting is only the preliminary step in its policy to keep informed concerning every phase of its painting work. The main detail of its policy consists of the accumulation of accurate records of each painting job, through which careful analysis can be made of each piece of work, including paint and labor costs, the quality of paint used, and the character of the painting work done.

In securing such records, the painting foremen on each division are required to make complete records in duplicate of each painting job as soon as it is finished, copies of this record being filed in the offices of the division engineer and the engineer maintenance of way. These individual job records are prepared on a special card form which calls for the following information concerning both the first and second coat of interior, exterior and roof work: Square feet of area, gallons of paint, color of paint, maker of paint, cost per gallon, cost of miscellaneous material, total cost of material, cost of painter labor, cost of cleaning, and total cost. Accompanying the information called for on the card form, the foremen are required to submit supplemental reports covering all special details surrounding the particular item of work covered, such as unusual conditions of the surfaces, character of cleaning required, weather conditions, delays, etc.

From the information contained in these reports, it is evident that both the division engineer and the engineer maintenance of way have a complete record of each building painted, which is of value not only as a current record, but of more importance, as a means of checking the costs of successive paint jobs and the quality of the work done. These reports also make it possible to ascertain accurately and in detail just what economy there is in the use of special painting equipment, and also the manner in which paint applied by one method will stand up in comparison with that applied by another method.

Summary Sheets Provide System Check

In order that a system check may be kept on the painting of each division, all card reports of individual jobs received at the office of the engineer maintenance of way are compared with the division painting program concerned, and then checked individually in detail to see that standards were followed

ANALYSIS OF BUILDING PAINTING ON CHAMPLAIN DIVISION

Does not include signals nor dwellings of Real Estate Department

Main Line	Int.	Ext.	Total	Equivalent Area	To be Painted in 1926	1927	1928	1929	1930
Clemons	233	496	729	800			800		
Dresden	462	896	1358	1400			1400		
Watchman Shanty		43	43	50			50		
Putnam	363	739	1102	1200			1200		
Watchman Shanty		19	19	20			20		
Spellmans		36	36	40					40
West Chazy	407	1221	1628	1700					1700
Chazy	592	812	1404	1600					1600
Cooperville	61	338	399	400					400
Rouses Point	4693	3613	8306	8600	8600				
Total	20397	32947	53344	56000	8920	12190	10100	13500	11610

The Form in Which Each Division Prepares Its Five-Year Building Painting Program

in every respect. When this has been done a record of each painting job is made on a summary record of the engineer maintenance of way, which is designed to keep him informed as regards building painting over the system, with the least encroachment on his time. This latter record gives the location, name, type and dimensions of each building on the railroad, grouped by divisions, followed by individual columns allotted to consecutive years, in which record can be made. The notations in this record are written entirely with the three letters, O, I and R, representing respectively, outside, interior and roof. Thus it will be noted in the reproduction of a section of this record shown herewith, that the pump house at Port Henry was completely painted in 1922, and again, five years later, in 1927. If any part of this structure had been painted in years other than

THE DELAWARE AND HUDSON COMPANY

BUILDING PAINTING RECORD

Legend
Painted Outside O
" Inside I
" Roof R

DIVISION Champlain

STATION	NUMBER, NAME & DESCRIPTION OF BUILDING	FRAME BRICK OR CAR BODY	APPROX. DIMENSIONS			DATE PAINTED													
			Lgt.	Wdt.	Ht.	Prior to 1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
Port Henry	Pump House	Frame	14	13	10					O-I-R					O-I-R				

A Section of a Sheet in the Building Painting Summary Record

deferring of repainting work for another year, and possibly two. In either case the judgment of the bridge and building master governs, the program and other records being altered accordingly. As new buildings are erected or old structures removed, the program and records are likewise altered so that at any time they show the correct status of building painting.

As a check on the written records, it is the practice

Stencil #806
Sheet ____ of ____

THE DELAWARE AND HUDSON COMPANY

BRIDGE PAINTING RECORD

Champlain Division

Main
Branch of Main Line

	Bridge No.	Location Miles No.	Location Miles So.	Location Station	Type of Bridge	Total Wt. of Bridge	Date painted and kind of paint used: Paint	Date	Paint	Date	Paint	Date	Paint	Date
	158.93		197	Valcour	1-T 3 L.O.T	240,589#	Graphite	12/27						

A Section of the Summary Form for Bridge Painting

1922 or 1927, the letter indicating that part would have been inserted under the year in which the work was actually done, instead of as shown.

Flexibility of Program Permits Changes

Through the records kept on the D. & H., simple as they are, it is obvious that there is little likelihood of a widely fluctuating painting program from year to year, or the possibility that certain buildings will be overlooked and allowed to run down in either physical condition or appearance. It is also highly improbable that uneconomical methods of painting will be continued for any period of time, and likewise that a poor quality of paint will escape detection.

While building painting on the D. & H. is laid out on a five-year basis with certain painting jobs assigned definitely to each year, it should be understood clearly that the system is applied with sufficient flexibility to allow whatever changes or adjustments may seem desirable. Thus, under certain conditions one building may be found to require outside repainting after four years, while in another instance, the painted condition of a building may justify the

of the D. & H. to indicate plainly on every building the dates of original and subsequent painting. In the case of stations, these dates are placed inside the baggage room, on the top rail above the baggage room door, in letters one inch high. Painting dates on all buildings other than stations are placed in an inconspicuous place on the left rear side at a point near the eaves. In every case all previous dates of painting are allowed to remain as a matter of record.

Similar Records of Bridge Painting

Bridge painting on the D. & H. is handled under a less set program than building painting, it being the thought that iron and steel structures should be inspected frequently and repainted in their entirety

or in part whenever conditions require, regardless of the date of last painting. On this basis, all important iron and steel structures on this road are inspected periodically by bridge and building department inspectors, bridge and building supervisors, the bridge and building master, and the division engineer, and on the records of these inspections is based the bridge painting that is to be done in any particular year.

As in the case of building painting, bridge painting is also carried out under rigid specifications and instructions, which are followed in every instance unless permission has been granted to deviate from them for good reasons. One of the special items of these specifications is with regard to painting records, it being to the effect that when painting all steel structures, the date, kind of paint, and number of coats shall be stenciled in plain characters on one or more members of each structure where they can be seen readily.

Supplementing the field record of each bridge paint job an office record is kept which follows closely that maintained covering building painting. This record consists of an individual card form for each structure painted, and summary sheets which group the various structures by divisions and provide space for painting dates over a considerable period of years.

The first of these records, which contains a complete statement of the work done, the paints used, and the labor and material costs incurred, is made out in duplicate by the painting foremen on the completion of each job. As in the case of the building record cards, both of the bridge record cards are sent to the division engineer, one for his file, and the other for the file of the engineer maintenance of way. The summary record of bridge painting referred to previously is primarily for the information of the division engineer and the engineer maintenance of way, to keep them currently informed regarding the work being carried out.

Through these various painting records the Delaware & Hudson can answer the questions raised at the beginning of this article—Where do we stand on our maintenance painting? What is it costing us? What must be done this year, etc.? Furthermore, it is constantly informed on these questions, and at any time is in a position to determine each move in its painting work, based on the actual facts.

How to Test Spring Washers in the Track

By W. R. HILLARY

Sales Engineer, National Lock Washer Company, Newark, N. J.

THE specifications for spring washers adopted by the American Railway Engineering Association in March, 1926, give exact and detailed instructions for the conduct of laboratory tests for determining if these devices can meet the requirements. The language is so clear that little, if any, technical knowledge is required by the tester, for each step is described fully and little is left to the imagination. Furthermore, one may easily ascertain whether the specimens barely pass the requirements, or if they pass by a wide margin and how wide that margin is.

Although such laboratory tests will demonstrate the principles involved, as well as the truth or falseness of the claims of the manufacturers, there is, naturally, the man "from Missouri" who wants to be shown what various classes and types of spring washers will do in track. The suggestions that follow are offered to that man for his consideration and for what they may be worth to him in making his field tests.

At the outset, it should be clearly understood that with new rail, new heat-treated and properly-designed joint bars, new heat-treated bolts of ample diameter, and nuts of such size and character as to take full advantage of the modern bolts, little perceptible difference in effect will be apparent for some time. This is true, whether the best spring washers be used or none, providing the track is well tied, ballasted and maintained.

"Some time" may be anywhere from a few months to over a year, depending on the weight, density and character of traffic, the weight of rail, the yield of the roadbed, the climate and other factors. Evidently no definite period can be fixed with all these variables. The character of rail as to hardness, uniformity and weight, especially, are important factors which affect this "some time." Again, no inflexible "Specifications for Field Tests of Spring Washers" will be applicable to all types of spring washers or "no-nut-locks." Such specifications, however, plus common sense, will be a helpful guide to the conscientious investigator and it is with that thought that what follows is offered.

Installing Test Sections

(1) Assign an engineer with an analytical turn of mind to install the tests and to follow them up with periodical reports. The average track foreman, supervisor, roadmaster or division engineer is too busy with a multitude and variety of subjects to give it the attention it deserves and, therefore, to justify the cost. Unless this assignment is made, the test will almost surely be lost sight of until some diligent file clerk digs it up. The evidence will then be hearsay and not facts.

(2) Select a stretch of track where all devices will be subjected to the same conditions:

(a) Same traffic—preferably heavy and fast.

(b) Same character of track—either all tangent or all curve, and the same degree of curve—same age, same condition, same track foreman or foremen, same force.

(c) Use only one kind of spring washer on any one joint, otherwise there will be divided responsibility.

(d) The different kinds of spring washers may be placed on alternate joints of each rail, but the principal objection to this is that the ability to observe the riding qualities from a train is made difficult

if not impossible. For that reason, it is suggested that about a half-mile of track (both rails) be equipped throughout with one device, the next half-mile with another, and so on.

(e) Use the same length wrenches and the same men over the entire test section.

(3) Before taking any record, tighten the bolts the day after the rail is laid, again within a week and again within a month. Keep on tightening until the scale is off the joint bars and rail, and you are sure that the joint bars are "home."

(4) Instruct all concerned not to touch a bolt in the test stretch (except in an emergency) unless the man in charge is present. If they do, report in full just what they did.

(5) Paint the number on each joint for identification.

(6) Identify the end bolt in each joint that is nearest the beginning of the test stretch as No. 1, and the others consecutively.

Conducting the Tests

(7) Tighten periodically (see (4) above), not oftener than quarterly.

(a) Mark the ends of the bolts and the top half of the faces of the nuts with a vertical keel line, in advance of tightening.

(b) Record the number of 1/8 turns for each nut, and sum up the total. This is one measure of the relative degree of tightness but not the only one, as will be disclosed later.

(c) Observe and record the amount of rail batter, using a steel straight edge the length of the joint, and steel feeler thickness gages. The steel straight edge should be mounted on steel blocks about 3/32-in. thick, and the distance down from the straight edge to the top of rail along the center line of the head over each bolt and at points about ½ in. back from the ends of the rails, should be recorded to 0.001 in.

(d) Observe and record for each joint any unusual flow of rail, chipping and batter that have taken place. In the case of the latter, measure the hardness with a portable hardness tester—the rail may be found to be defective.

(e) Measure and record the expansion spaces between rail ends.

(f) Remove the overflow of rail with a hack saw or other means.

(g) Do not back up nuts after tightening to square them up. Leave them as they were—a ⅛ turn backward means a loose bolt in some cases. To do this is to sacrifice efficiency for looks.

(h) Record the time required to tighten the bolts, but give it little weight. For instance, it takes no more time to wrench a nut a ¼ turn than ⅛, but the former may have been loose and the latter tight.

(i) Record breakages, replacements and other failures of spring washers. If one is replaced, identify it on the ground and wrench the nut up thoroughly before recording any turns.

(j) Have all failed devices sent to a responsible man for examination, and to the manufacturer for similar action.

(k) Use spring washers taken from stock—not hand picked ones, but ascertain first the manufacturer's heat number, etc., for possible future reference in case of defective material.

(l) Be sure the nuts are not "frozen" (immovable, yet possibly not tightened); otherwise the record of turns tightened is worse than useless. Record such instances; it is typical of "no-nut-locks," and is usually due to damaged bolt threads.

The number of ⅛ turns that the nuts on various devices are wrenched is one measure of relative tightness, but not always a sure one and may be deceptive. The nut may only be capable of being wrenched ⅛ turn and from the record would appear tight while actually it may have been loose enough to permit movement of the rail ends with respect to each other. Back such a nut off ¼ turn and the truth of this statement will be apparent. It is not unusual to find a bolt so loose that it can be rattled by the hand and yet the nut on that bolt could be and was subsequently made tight by wrenching up the nut less than a ¼ turn.

(8) Cut off the head of an occasional bolt with a chisel or the oxy-acetylene flame, so that the bolt may be removed without wrenching off the nut. Then observe the mutilating effect, if any, that the various types of spring washers have had on the nuts. That will also be an indication of the amount of wrenching power that has been inefficiently dissipated in friction, and hence not actually applied to tightening bolts.

Although variables exist inevitably in tests of this sort, the average of a large number of observations will, in connection with laboratory tests, give the "man from Missouri" convincing proof of the merits of the various spring washers he has under consideration, and will enable him to select the one that is the most economical per year, which is the acid test.

Looking at the First Railway in America, Built Near Quincy, Mass., in 1826 to Haul the Stone for the Bunker Hill Monument—On the Present Line of the N.Y.N.H.& H.

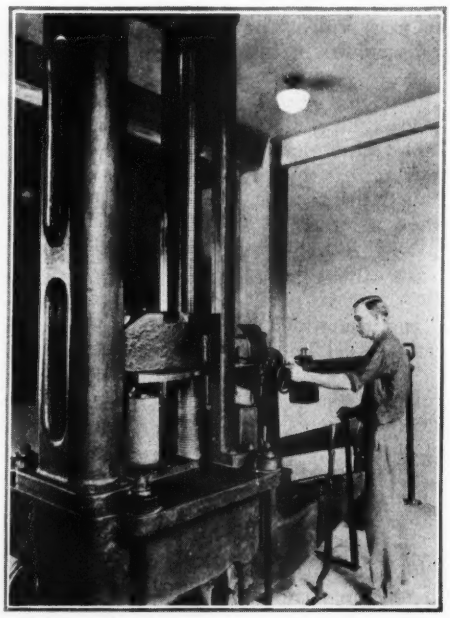
Railway Materials Hold Important Place at A. S. T. M. Meeting

Convention at Atlantic City Considers 100 Papers and Committee Reports. Concrete Actively Discussed

NEARLY 100 papers and committee reports on the characteristics and methods of testing construction materials were presented at the thirty-first annual meeting of the American Society for Testing Materials, which was held at the Chalfont-Haddon Hall, Atlantic City, N. J., on June 25-29. These papers covered a wide range of subjects in the field of material specifications and tests. A number of them contained reports of general interest to maintenance men.

Much attention was given to cement and concrete by a number of committees and individual members who presented papers. Most of the discussion however, related to improved methods and apparatus for determining the various qualities of these materials. One of the most interesting papers from a practical standpoint was that on the resistance of portland cement concrete to the action of sulphate waters as influenced by the cement, which was presented by D. G. Miller, drainage engineer, Bureau of Public Roads, U. S. Department of Agriculture. Mr. Miller pointed out that standard portland cements from different manufacturing plants vary greatly in their resistance to the action of sulphate water, this being evidenced by laboratory and field tests of 30 portland cements after exposure periods ranging up to more than three years. Under the same exposure conditions the more resistant cements have shown a life eight times greater than those of least resistance, while the ten most resistant cements showed an average life nearly four times that of the ten least resistant cements. It was also pointed out that the standard physical tests of portland cement give no indication of their resistance to sulphate waters, and that a new accelerated test is needed to determine this characteristic.

In conclusion Mr. Miller stated that, with so great a difference in the resistance of portland cements to the action of sulphate-bearing waters, the first consideration for concrete which will be exposed to such action should be the cement itself, and that regardless of all other precautions, the use of any cement of low resistance, as determined by special test, should be avoided. In the absence of a satisfactory accelerated test for determining the resistance of cements to the action of sulphate waters, a new six-month briquet test was outlined in the paper and recommended for use.



A Compression Test of a Concrete Cylinder

New tentative specifications for reinforced concrete culvert pipe were submitted by a committee working jointly with six other organizations, including the American Railway Engineering Association. These specifications supersede those adopted in 1926, the principal changes being relative to the amount of circumferential reinforcement, the load requirements for extra-strength pipe, and the inclusion of an absorption test.

The Committee on Concrete and Concrete Aggregates presented an extensive report, included in which were new tentative specifications for concrete aggregates. In a special report on the design of concrete, the committee laid stress on the subject of concrete mixtures, dealing specifically with the five essential steps involved in the application of the relationship between the water-cement ratio and strength. These steps were discussed as: (1), the selection of cement, aggregates and water; (2), the selection of the strength for which to design; (3), the determination of the proper proportions of fine and coarse aggregates to give the desired workability for the given water-cement ratio; (4), the determination of the water-cement ratio applicable to the material selected; and (5), the conversion of the proportions into field units.

Early-Strength Cements Considered

In discussing cement, the committee stated that the tendency of present practice is to over-emphasize the importance of high, early-strength cements in the manufacture of concrete, and pointed out that it has not yet been proved to its satisfaction that high, early-strength cements are the best, if other factors, such as soundness and permanence, are given proper weight.

Supplementing the report of the committee was a paper by George Conahey, research engineer of the Celite Company, on the effect of admixtures on the water-cement ratio-strength relation of concrete. Referring to data presented by J. C. Pearson and F. A. Hitchcock in 1924, and data presented by D. A. Abrams in 1920, it was pointed out that when 10 per cent of hydrated lime, 6 2/3 per cent of kaolin or 3 1/3 per cent of Celite, by weight, of the cement were used as admixtures, the water-cement ratio—strength relation of the concrete was changed, and that a larger quantity of mixing water could be used and the same

strength obtained. In other words, for a given strength, more water can be used in mixing concrete containing these admixtures than can be used with a concrete without admixtures.

Among other papers presented under the subject of concrete was one describing a laboratory method for testing the durability of concrete under alternate freezing and thawing at low temperatures; another on the permeability of concrete, describing a method of determining the flow of water through concrete, and a third describing a new method of determining the workability of a concrete mixture. In this latter method, the workability of a concrete mixture is measured by the power consumed in mixing the concrete. A concrete mixer is driven by a suitable motor, and the load applied to the mixer is measured by a polyphase wattmeter supplied with proper transformers.

Iron and Steel Are Discussed

In an effort to harmonize the society's specifications for structural steel with those of the American Railway Engineering Association, the Committee on Steel submitted revisions in several specifications for structural steel, these including specifications for structural steel for bridges, specifications for structural steel for buildings, specifications for structural nickel steel, specifications for structural silicon steel, and specifications for billet steel concrete reinforcement bars. Requirements for copper-bearing steel were also included in several specifications. The committee proposed new tentative standards for lap-welded and seamless steel pipe, black and galvanized, for ordinary uses, and recommended that the tentative specifications previously adopted for soft steel track spikes and for steel tie plates be continued as tentative for another year.

The Committee on Wrought Iron proposed tentative specifications for iron and steel chain of two classes: Crane chain for slings, hoists, steam shovels and marine uses; and proof coil for railroad cars, construction and forestry work.

A Study of Cast Iron Pipe

A study of centrifugally-cast pipe versus sand-cast pipe was the subject of a paper presented by F. N. Menefee, professor of engineering mechanics, and A. E. White, professor of metallurgical engineering, both of the University of Michigan. As outlined in the paper, 48 pieces of pipe, 24 centrifugally-cast and 24 sand-cast, were subjected to tests for tension, variation in thickness, radial deflection, inside smoothness, cutting, metallography, impact, radial compression, bending, hardness, removal of strains and chemical composition. In the first six tests mentioned, the results were more or less favorable to centrifugally-cast pipe; in the next four tests the results were favorable to sand-cast pipe, and in the last two tests, no decision was reached. The principal conclusions drawn by the authors of the paper, as a result of their findings, were that under present practice and on the basis of similar costs, there is no outstanding advantage for either class of pipe, but that taking the same factors of present practice and cost into consideration, the purchase of centrifugally-cast pipe is recommended. No attempt was made in the report to cover such phases as installation, maintenance, tests of joints and other matters of similar character.

The reports of the committees on Corrosion and Preservative Coatings again showed the marked superiority of copper-bearing metal over non-copper-bearing metal in the matter of resistance to corrosion when exposed to air. This was brought out particularly in the report of Committee A-5, which covered the exposure tests being conducted by the society at Fort Sheridan, Ill., Pittsburgh, Pa., Annapolis, Md., Washington, D. C., and at other points. After 11 years of observations at Fort Sheridan, practically all of the light-age material, both copper-bearing and non-copper-bearing, had failed, but it was pointed out that the failures in the copper-bearing sheets have been, in the main, after 126 to 132 months exposure, whereas the non-copper-bearing groups have been showing failures in substantial numbers each year since the end of the first 37 months of test. Continuation of the total immersion tests of specimens in city water confirmed previous findings for the specimens that were submerged in mine drainage and brackish water, to the effect that corrosion resistance of iron and steel when submerged, is practically uninfluenced by copper content within the range of the tests.

Committee A-5 also submitted tentative specifications for zinc-coated (galvanized) barb wire and for zinc-coated (galvanized) wire strand, and reported substantial progress and large interest by state highway departments and the railroads in the investigation which it is instigating on the subject of metal culvert corrosion.

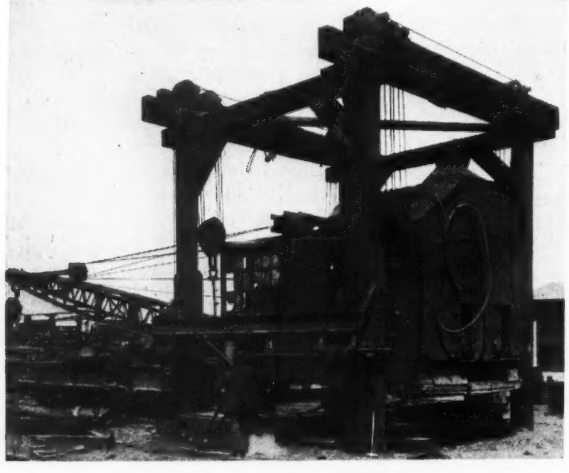
The Committee on Preservative Coatings for Structural Materials, in an extended report, submitted a large number of tentative standards and revision of standards covering oils and various paint pigments. Among these were a new tentative standard for raw linseed oil, and the revision of tentative standards for boiled linseed oil and for aluminum powder for paints.

A sub-committee reported on the method of application of paint by spraying, regarding a test installation in October, 1921, where two frame dwelling houses were spray painted and two similar houses were brush painted. The outstanding conclusion reached after a number of inspections of the test coatings, was that the paint applied by the spray method has not failed more rapidly than that which was brushed.

At Devils Gate on the Union Pacific in 1869

Hoist for Repairing Locomotive Cranes

THE maintenance and repair of locomotive cranes often present difficult problems when it is necessary to remove the bed plate of the crane from the car body, owing to the fact that the body of the crane is no wider than, and is not as long as, the car on which it rests, thus making jacking a slow and expensive task when no other mechanical means are available. To obviate these difficulties the Delaware, Lackawanna & Western has in service at Hoboken, N. J., where the general repairs to all the locomotive cranes on the Morris and Essex division are made, a hoisting device with which it is possible to lift a crane from its car body and to remove the latter from under the crane in 15 min. with only two men.



Hoist for Locomotive Cranes in Service

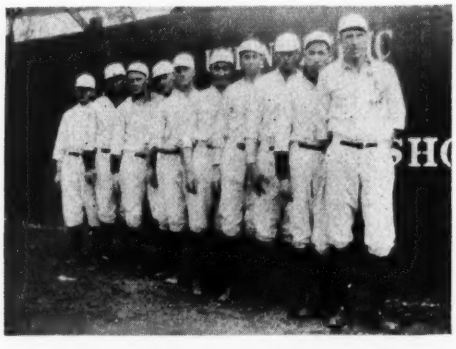
The device consists essentially of a frame of heavy timbers from which are hung four sets of blocks and falls, so arranged that cables can be passed under the ends of the bed plate of the crane and attached to the blocks, after which the hoisting lines are operated in unison by a reversible steam winch with a worm gear transmission. Provision is also made for suspending snatch blocks for hoisting heavy parts of the machinery separately and other snatch blocks are so arranged that the winch can be used for pulling cars when desired. The frame is built over the end of a sidetrack and a drop pit is provided to permit work on the under side of the crane. Eye-bolts are embedded in the bottom of the pit, for use in holding down a crane when it is necessary to jack in a new center pin, as must be done with certain types of these machines.

The cost of this hoist was small, as the frame and mechanism were assembled from discarded parts and materials from various sources. The timber was selected from released falsework material; the drums and shafting were recovered from obsolete coal-handling machinery; the sheave blocks were taken from discarded equipment for hoisting transfer bridges; the cables were some which had been retired from active duty on locomotive cranes; while the steam winch was one which had been used for warping coal barges along a slip adjacent to one of the railroad's piers. Steam for the operation of the winch is taken from a nearby steam line but in the event of the failure of this supply it is possible to obtain steam from the boiler of the crane which is hoisted, thus making the crane hoist itself.

The hoist was erected originally for use in connection with extensive repairs to a locomotive crane and it is said that the savings effected on its first job were more than enough to pay the entire cost of the installation. The device is now used in the general maintenance and repairs of 16 locomotive cranes and the fact that the cost of maintaining these cranes has shown a marked decrease during the three years it has been in service indicates that at least a part of this decrease may be attributed to its influence. The device was planned and assembled by Christian Kiernan, general foreman of locomotive crane repairs. We are indebted to M. H. Doughty, division engineer of the Lackawanna at Hoboken, N. J., for the foregoing information.

L. A. & S. L. Fosters Athletics

THAT the track, bridge and building, and water service gangs on the Salt Lake division of the Los Angeles & Salt Lake contain good material for basketball, baseball and track teams is demonstrated in the record made by the members of the Miscellaneous Employees' Group Athletic Club of that division. Although organized only about 18 months ago, as described in *Railway Engineering & Maintenance* for October, 1927, page 410, this club now has more than 200 members, which is the largest membership of any of the clubs on the Los Angeles & Salt Lake with the exception of the Los Angeles Athletic Club. Several basketball and baseball teams were organized, and enjoyed a successful season, but the crowning achievement of the Miscellaneous Employees' group was the part its members played in the winning of the track meet of the Salt Lake division. Following this, they scored 36 points of the 84 1/3 points secured by the L. A. & S. L. unit in winning the Union Pacific System track and field meet, furnishing 10 out of the 23 athletes which made up the team representing the Salt Lake division of the L. A. & S. L.



The Baseball Team of Bridge and Building Gang No. 534

However, the activities of this organization are not restricted to athletics. The club has purchased 65 textbooks which have been placed in various outfit cars and in addition has subscribed to *Railway Engineering & Maintenance* for every road gang. Plans are now under way for the financing of the purchase of radio outfits for every bridge and building, and water service road gang before the close of 1928. The second annual banquet of the association, which was held at Milford, Utah, was attended by 157 members and guests, the railroad supplying a special Pullman sleeper to enable the members to make the trip to Milford with the least inconvenience.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE OCTOBER ISSUE

1. *What limitations, if any, are there in the use of spring frogs on curved as well as tangent track?*

2. *When removing the decks of filled timber trestles, is there any advantage in removing the caps as well as the stringers?*

3. *The A. R. A. recommends a width of 7 in. or 7½ in. for tie plates on hardwood ties, but make no recommendation as regards softwood ties. Are these widths sufficient for the latter, and if not, what widths should be used?*

4. *Are the advantages of power trench pumps sufficient to justify their being furnished for water service gangs?*

5. *In relining main tracks on curves, are there any objections to introducing compound curves with small changes in radii to obviate large throws? What is the desirable limit of throw on well ballasted track?*

6. *What special inspection should be made of the various types of heating plants before the advent of cold weather?*

7. *In preparing the track for winter, what special precautions should be taken, especially where heaving is apt to occur?*

8. *What is the best method of protecting reinforcing bars from rust when unloaded where they are to be used? What is the best method of removing rust which may have formed on them?*

Water Service Repair Parts

Is it practicable to keep a complete list of the water service repair parts carried at various points so that they may be available for other points in cases of emergency? Where should such a list be kept?

It Is Both Practicable and Desirable

By C. R. Knowles
Superintendent Water Service, Illinois Central, Chicago

It is entirely practicable and very desirable to keep a complete list of water service repair parts and other material carried at various points in order that they may be available where required in case of emergency. In order that the stock of spare parts may be kept to a minimum, it is advisable to carry them at one or two central points, preferably at the general or division storehouses. Copies of lists or inventories of spare parts on hand should be distributed to all division storekeepers and supervisors of water service.

Consideration should be given to the location at which the equipment may be needed. For example, certain parts may be common to existing facilities at all points on the system, while in other cases the necessity for these repair parts may be confined to one or two locations or divisions. In the latter event, they should be kept only on the divisions where they will be used.

On one of the middle western railroads, the division storekeepers are required to prepare monthly lists of all stocks of water service materials on hand at their respective storehouses. Copies of these lists are furnished to the general storekeeper, assistant general storekeeper, superintendent water service and to the other storehouses. This system has worked out very satisfactorily and has resulted in reducing the stock of materials very substantially. In addition to the reduction in stock, it facilitates the prompt furnishing of materials in cases of emergency.

Rate of Run-off When Raising Track

When making high lifts on ballast, what should be the maximum rate of run-off to be left at the end of the day's work?

Depends on Traffic and Amount of Lift

By V. H. Shore
Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kansas

The rate of run-off depends on several conditions. If, at the end of the day's work, the track is to be made safe for the operation of trains without speed restrictions, the run-off should be made at the rate of ½ in. to each to 30 ft. of track. For example, if the lift is three inches, the run-off should be 180 ft. long.

If speed is to be restricted during the night where the lift is being made, the run-off can be shortened accordingly, but no run-off to be left at the end of the day's work should exceed 1 in. to each 30 ft. of track, regardless of the speed permitted. Where lifts

of three inches or more are made on the track, the speed of trains should be reduced until the track has had time to settle on its new bed, and been given a general spotting up after a week or 10 days service.

Depends on Speeds Permitted

By Roadmaster

The rate of run-off to be left at the end of the day's work, when making high lifts on ballast, depends entirely on the speeds permitted. Where speed restrictions are in force the run-off may be comparatively short, say 150 ft. long for a 6-in. lift for speeds of 30 miles an hour, but if full speed is permitted, the run-off should be double that length as a minimum, otherwise trains will receive severe jolts while passing over the run-off. In making the run-off, the changes at the ends should not be abrupt, but should be rounded off into vertical curves.

Run-offs to be left over night, should not be made on curves if it is possible to avoid them, and if they cannot be avoided, speed restrictions should be placed to protect them, since any irregularities in surface are much more noticeable on curves than they are on straight track, and there is also more likelihood of the track going out of line on curved run-offs. In any event, the run-off should be well tamped and lined before it is left at the end of the day's work.

Run-off May Be Short if Speeds Are Reduced

By Charles Sandoval

Section Foreman, Southern Pacific, West Chandler, Ariz.

Where lifts of from 12 to 14 in. are being made on ballast, slow orders should be placed to restrict the speed of trains and the run-off may be made in a distance of from 100 to 120 ft. The run-off should be made at a regular rate throughout its length, and care should be taken not to leave a dip at the lower end, for this is apt to cause the rail to become surface bent. A run-off of this length will enable trains to pass over it at slow speeds during the night, and will cost less than a run-off of greater length.

Grab Buckets for Bridge Work

What are relative merits of clamshell and orange peel buckets for bridge work involving both excavation and the handling of materials such as sand or crushed stone?

Both Types Have Certain Advantages

By Bridge Engineer

The choice as to the type of bucket to be used in bridge work depends on the kind of work to be performed, since the orange peel bucket is generally the most satisfactory for excavating open cofferdams and caissons, while the clamshell bucket is preferable for unloading sand, gravel and crushed stone from cars, and also for rehandling these materials after they are unloaded. On large projects, where considerable of each of these kinds of work is to be done, it is often economical to have each type of bucket available, particularly if large stones or logs are apt to be encountered when the bucket is used for excavation.

If only one bucket is to be used for both excavation and the handling of loose materials, a clam shell bucket of the digging type should be selected. These are available with removable teeth for use in excavating hard materials. With the teeth removed, this type of bucket is effective in unloading coal, sand, gravel or crushed stone from gondola cars, its shape enabling it to work close to the corners of the cars and to pick up such material from the floor of the cars with a minimum of shoveling by hand.

Clamshell Is Preferred for General Work

By F. H. Cramer

Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

For bridge work involving both excavation and the handling of loose materials such as sand or crushed stone for concrete, the clamshell bucket is to be preferred, since it is well adapted for excavation in ordinary soils and is better than the orange peel bucket for handling loose materials, especially when they must be unloaded from open cars. For this reason, we use clamshell buckets almost exclusively for bridgework, except where the material is very hard, as in stiff clay, hard gravel or loose rock. In such cases, we arrange to furnish both kinds of buckets. Where the digging is only fairly hard, it can often be handled satisfactorily with a clam shell by attaching teeth to the cutting edges of the bucket, which are arranged to permit the ready application and removal of the teeth. The orange peel bucket is often used where only excavation is to be handled, thus leaving the clamshells available for general purpose duties.

Use of New Joint Bars When Welding Rails

When applying new joint bars in connection with the building up of battered rail ends by the welding process, should the new bars be applied before or after the welding is done?

Application Before Welding Insures Better job

By Lem Adams

Roadway Assistant, Union Pacific System, Omaha, Neb.

We consider that new bars should be applied before the rails ends are built up, for where the rails are battered, the ends usually cut or wear into the tops of the bars, producing an unstable support for the rail. If the rails are built up before changing the bars, allowance must be made for this wear, and it is more difficult to obtain a finished job than when the new joints are applied before the welding is done. When the new joints are applied first, we are assured that the adjoining rail ends will be built up to the same plane. The only disadvantage of this practice is that the heat from the welding torch may be slightly injurious to the new bar, but we do not consider this of material importance.

On our lines, we seldom change the joint bars when building up rail ends, as we do not permit the rail batter to progress to the point where it ruins the bars.

Should Be Applied Before Welding

By V. H. Shore

Yard Foreman, Atchison, Topeka & Santa Fe, Dodge City, Kan.

Where new joint bars are to be applied in connection with the building up of battered rail ends by the welding process, they should be applied before the welding is done, but, if possible, in conjunction with the welding so that the joint can be built up before trains are allowed to pass over it, as other-

wise it is liable to become bent. Old joint bars are more or less bent where the rail ends are battered, and if allowed to remain during the building-up process, the application of the new joint later will make the surface of the rail end slightly higher. This will cause pounding at the rail end, and will result in damage to the joint bars, ties and rails.

Loss of Camber in Steel Spans

A further answer to the following question in the July issue:

Is the loss of camber in a steel span a sign of distress? What conditions should be investigated when this occurs?

Not Necessarily Serious in Pin-Connected Trusses

By Glen H. Trout
Bridge Engineer, Union Pacific System, Omaha, Neb.

If the span in question is a riveted truss which has really lost its camber, it certainly shows signs of distress. If the span is a pin-connected truss of ordinary length and originally had camber and lost a small amount, this would not necessarily be true, as, in the case of pin-connected trusses, the bars often become slightly worn and the pins channeled, on account of wear, to the extent that the span can lose its camber, while the diameter of the pins may not be decreased, nor the bars worn enough to affect the strength of the structure materially.

As to the investigations, a field inspection should be made to determine whether the actual sections and details conform to the drawings. The actual sections should be determined by caliper measurements after the removal of dirt and scale, and careful notation should be made of all defects, such as crooked, damaged, or otherwise defective members, worn pins, loose rivets, etc., whether the track is on the center line of the bridge, and whether there is unequal stress in the tension members. In the case of the latter, where the members are subject to secondary stresses, strain gage measurements should be taken.

After the inspection, the span should be recalculated for the equipment actually in use. In the absence of any defects in the various members, if the bridge is not overloaded with the actual loads moving over it, and it was known to have camber originally, it is probable that it had previously been overloaded to a point where the stress in the members exceeded the elastic limit of the material.

Corrosion from Brine Drippings

At what points is corrosion most severe on rails exposed to brine drippings? Under what conditions does this warrant special inspection?

Rust Pockets on Flange Next to Angle Bars Are Serious

By Division Engineer

Corrosion of rails from brine drippings is found to be most severe on the outside of the rails and especially at the receiving ends of the angle bars. The greatest amount of dripping occurs at locations at which stops are made, such as at water cranes, passing tracks, etc., the lower rail on curves, and where the speed is greatest on grades.

After several years' exposure to brine drippings, rust pockets from one to two inches in diameter will form adjacent to the angle bars and rail anchors, these appliances not only tending to catch the drippings, but also to prevent their drainage off the rails. As soon as the formation of these rust pockets is noted, special inspection is warranted, since the deterioration of the rail will proceed rapidly unless the corrosion is checked, resulting in the loss of several years in the life of the rail, on account of the loss of metal in the flange which is likely to cause broken rails.

Until such time as the American Railway Association eliminates the dripping of brine on the rails and fastenings, this damage to the track will continue, but it can be alleviated to some extent by the periodical oiling of the rails and fastenings.

The Base of the Rail Is Most Affected

By Maurice Donahoe
General Supervisor of Maintenance, Chicago & Alton, Chicago

The base and lower fishing angle of the outer side of the rail are most exposed to corrosion from brine drippings, although the angle bars, bolts, nuts, tie plates and spike heads are also damaged. On our Western division, where a heavy refrigerator traffic is carried, considerable corrosion occurs where trains stop for fuel or water, and also in sags where the slack between the cars runs together and is taken out, causing a jar to the cars. We oil the joints and bolts, but have not oiled the tie plates or spike heads. The tie plates are damaged somewhat by corrosion, but not to as great an extent as the joints, spikes and rails. We get about 10 years' service out of our rail on tangents on the main line, battered rail ends and corrosion having about equal effect on rail renewals.

Amount of Sand in Washed Gravel

When washed gravel is used for ballast, what should be the percentage of sand and the maximum size of the pebbles? What reasons lead to these conclusions?

Should Be Sufficient Sand to Fill the Voids

By H. R. Clarke
General Inspector Permanent Way, Chicago, Burlington & Quincy, Chicago

The maximum size of the pebbles permissible in crushed and washed gravel depends on the size and uniformity of the pebbles found in the pit, and the percentage of sand should be such that it will fill the voids between the crushed pebbles. Where the pebbles in the pit run fairly large, the maximum size of the pieces to be left in the ballast may be as large as two inches but if they are small, this size should be reduced to insure that there will be a large proportion of pieces with angular edges. The percentage of sand will vary somewhat with the size of the crushed pebbles, and should be sufficient to fill the voids. This latter is of particular importance on tracks carrying traffic such as coal or live stock, where considerable foreign matter is likely to fall from the cars, since, if the voids are filled, the foreign matter is prevented from working down into the ballast, where it impedes the drainage and causes puddled track.

On the Burlington, gravel obtained from a pit with a large proportion of small pebbles was crushed to a maximum size of two inches and 20 per cent of sharp torpedo sand was specified. This ballast did not give satisfactory results, and experiments were made with ballast from this pit, using from 0 to 30 per cent of

sand, and with different maximum sizes of the crushed pieces. As a result of these experiments, the maximum size of the stone was reduced to 1½ in. and the amount of sand was increased to 30 per cent. The gravel so prepared was found to work more easily than that with the larger stones and less sand, while the track became solid more quickly, and the ballast did not become foul in as short a time, since the filled voids permitted foreign matter to be removed before it had a chance to work down into the ballast.

Use About 40 Per Cent of Sharp Torpedo Sand

By W. H. Penfield

Engineer Maintenance of Way, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Our crushed and washed gravel ballast is secured from contractors, who also furnish gravel for concrete, and the coarse aggregate is crushed from the stones which are screened out of the concrete gravel. These stones are crushed to a maximum size of 1 in., after which approximately 40 per cent of sharp torpedo sand is added, the percentage varying somewhat with the size of the coarse aggregate in order that all the voids in it may be filled. This is done to prevent cinders, coal dust and other matter from finding their way into the ballast, thereby causing it to become foul and interfering with its drainage. The sand also keeps the rounded pebbles, which are not crushed, from rolling under the ties, and forms a solid bed for the ties. There would be no objection to increasing the maximum size of the coarse aggregate to 1½ in., but it is not desirable to have the maximum larger than that. We have used washed gravel prepared in this manner for four years with good results.

Steep Grades for Pipe Culverts

What is the steepest allowable grade for various types of pipe culverts carrying water from steep hillsides?

Steep Grades Are Apt to Cause Trouble

By Bridge Inspector

We have no rule in regard to the maximum grade to be used when installing pipe culverts, but endeavor to get as light a grade as possible without too great an expenditure. We have a number of culverts with steep grades, which were installed many years ago, and these have given us considerable trouble where the soil is of such a nature that it washes easily. The water emerging from the end of the pipe has a tendency to wash large holes in the ground and if these are not kept well filled with riprap, they are apt to cave until they reach the embankment. Aside from this feature, we have had no trouble on account of the steep grades in the culverts, and this has occurred only where the soil at the end of the culvert is loose and easily washed.

Steep Grades Should Be Avoided

By Bridge Engineer

The question as to the steepest allowable slope for pipe culverts is usually encountered where the embankment is located on a side hill, and here the decision as to the allowable slope is influenced somewhat by the relative costs of installing the pipe along the natural surface, where a good foundation can be secured, the expense of a longer pipe, and the cost of providing an apron to protect the slope of the embankment if a flatter grade is used, which necessitates placing the outlet of the culvert at some distance above the natural surface of the ground.

A steep grade in a culvert is apt to cause trouble at the outlet, unless the ground beyond the end of the pipe is on about the same grade as that of the culvert; it is also apt to wear the inner surface of the pipe where coarse sand or stones are carried by the water. For this reason, the slope of the culvert should not exceed 3 per cent and where steeper grades are necessary, the ground at the outlet should be protected by heavy riprip or concrete to prevent the discharged water from cutting holes in the ground at the foot of the embankment.

Coping for Brick Walls

What are the relative merits of the different types of coping for brick walls?

Vitrified Tile or Precast Concrete Are Satisfactory

By Supervisor of Buildings

Vitrified tile and precast concrete copings are in general use as copings for brick walls of ordinary railway buildings, and the choice between these two often is a matter of comparative costs. Where the concrete coping can be made or secured at low cost, it is satisfactory if care is taken to fill the joints thoroughly to prevent the entrance of water to the brickwork and to prevent the coping from being loosened from the top of the wall.

Vitrified tile coping may be obtained in sizes to fit various standard widths of walls and is made with flanges which extend down a short distance below the top of the wall, thus protecting the mortar joints from the weather and also helping to retain the coping in place if the joint should become loose. This type of coping is usually made with socket joints which also are of marked aid in preventing the entrance of water. For ordinary buildings they are usually furnished in red or gray colors. Terra cotta tile of similar design but of more elaborate pattern may be used for buildings where architectural appearance is given more consideration.

The First Railway Frog in America Taken from the Granite Railway Built in 1826 Near Quincy, Mass., Now on Line of N.Y.N.H.& H.

New and Improved Devices

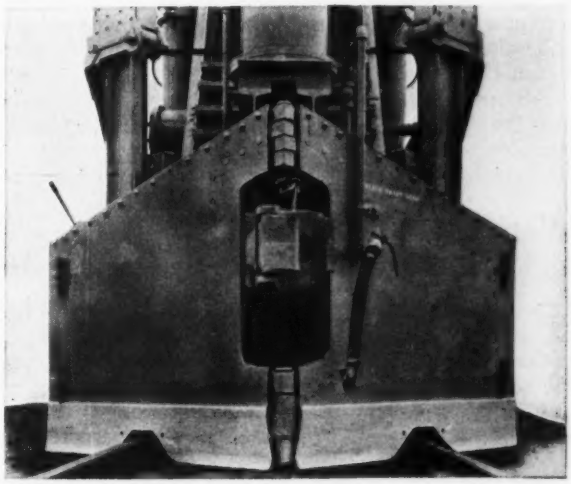
Jordan Gets Out New Spreader

IN GENERAL, the amount of work that can be done by a spreader car is determined by its weight and the spread of the wings, providing it is being employed on a line on which locomotives of sufficient tractive power can be operated to develop the full capacity of the machine. Studies made by the O. F. Jordan Company, East Chicago, Ind., of the performance of its spreaders on various railroads were responsible for the conclusion that the economies of power spreading and ditching could be further increased by the use of a larger machine and as a result a new model of spreader has been developed which not only has greater weight and length and longer wings, but embodies a number of improvements which afford greater flexibility in operation. The difference between the new and older models is indicated in the following table.

	Older car	New car
Total Weight	85,000 lb.	115,000 lb.
Length of car	35 ft.	50 ft.
Maximum spread of wings*	21 ft. 6 in.	24 ft. 3 in.

*The spread for the old car is that obtained at an angle of 52 deg. from the center line of track while that for the new car is based on an angle of only 45 deg.

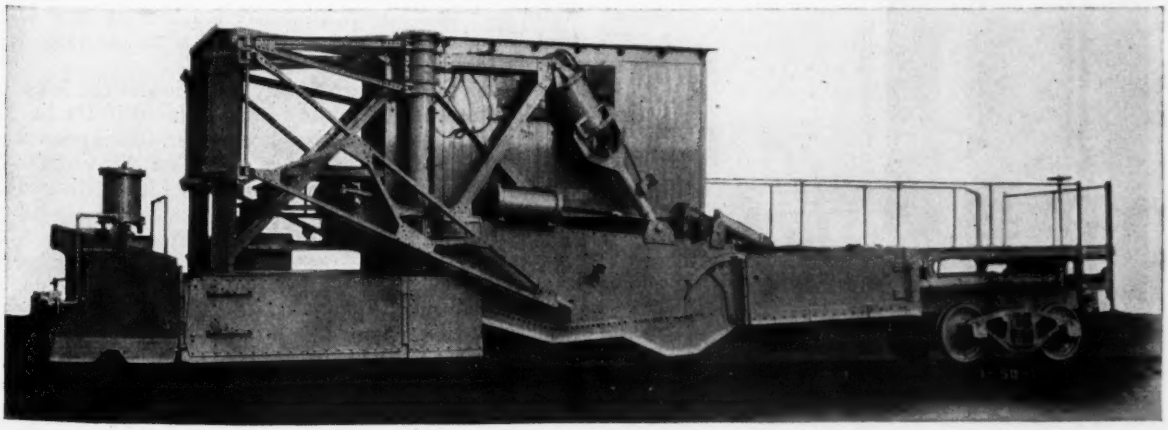
In addition to a greater weight, the new spreader has its center of gravity 40 per cent lower than that of the old spreader, thereby insuring greater stability and uniformity of the grade in ditching work. But more distinctive than the mere increase in weight and size is the introduction of an entirely new feature, a telescopic hydraulically-operated wing brace which



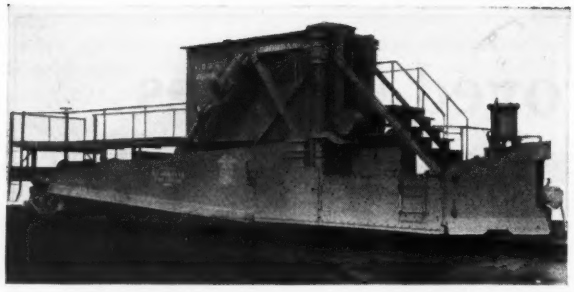
The Front Plow Will Remove Ballast to Within ½ In. of the Top of Ties

enables the operator to change the splay of the wings instantly while the car is in motion. The advantage of this is evident to anyone who has operated a spreader. It permits spreading to be done where fixed objects would be in the way of the older type of machine.

In the new machine, the outer end of the wing can be raised three feet above, or dropped five feet below



The New Car Equipped with Ditcher Wings



The New Spreader Weighs 115,000 lb.

the inner end, thereby making it possible to spread to a level surface in spite of an inclined position of the car on curves, due to superelevation. The wing when in the level position will cut to a depth of three feet below top of rail. The front plow can be lowered so that the bottom edge comes within ½ in. of the top of ties. As a consequence it can be used in ballasting to remove practically all ballast from the top of the ties.

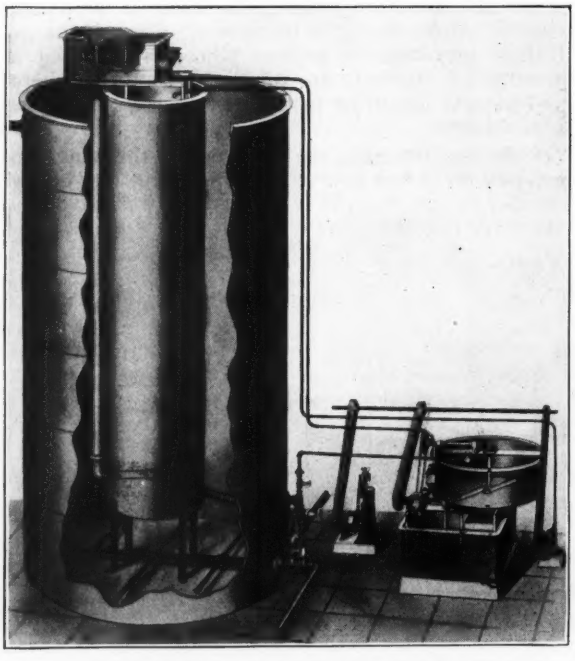
All operating cylinders on the new car are of such size that changes in the position of the wings and the plow can be made easily with an air pressure of 60 lb. per sq. in. The new car is furnished with a cab.

Water Meter Proportions Flow of Treating Chemicals

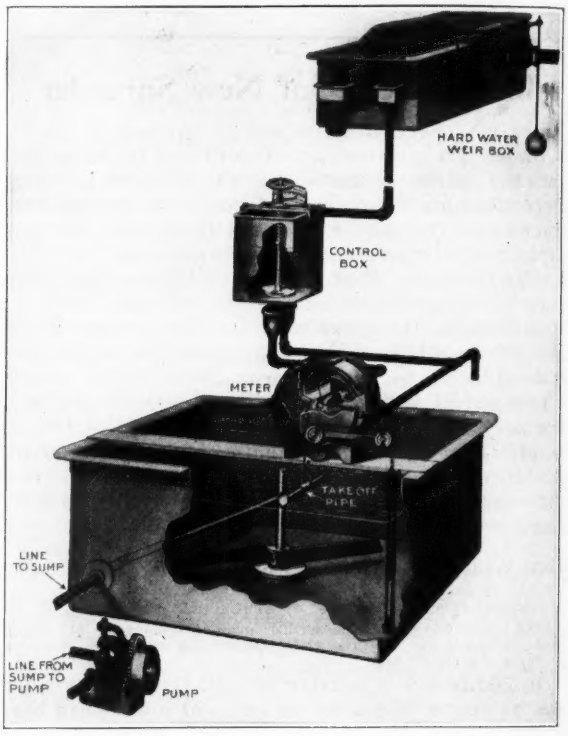
THE American Water Softener Company, Philadelphia, Pa., has developed a water softener of the continuous type for use with lime-soda ash treatment, which is designated as Type R. This softener is designed to apportion the treating solution to a variable rate of delivery of the raw water to the softener as well as for any varying conditions of hardness.

The raw water is delivered through a float control valve to the hard water weir box shown at the top of the softener in the general view, which is equipped with stilling baffles to prevent waves in the weir compartment. The water is discharged from the hard water box through two weirs, one large and one small, set in the same plane. The large weir discharges the bulk of the raw water directly to the downcomer in the settling tank while the small weir delivers an accurately proportioned small amount of the raw water to the solution-feeding apparatus at the ground level. This is shown in the detail view.

The water having been carefully analyzed and the amount of chemicals for a 12-hr. or 24-hr. run determined, a charge of solution is prepared in the upper of the two tanks and held in reserve to replenish the lower or feeding tank when the supply therein is exhausted. The orifice at the top end of the swiveled take-off pipe in this feeding tank is brought to the surface of the solution and held in position by a chain which passes over a sprocket on the shaft of a water wheel meter. This meter is revolved by the water that passes through the small weir in the hard water box and lowers the swiveled take-off pipe to feed the chemicals in exact accord with the rate of flow of the raw water to the softener.



General View of the Type R Softener



Details of the Proportioning Apparatus

In order to take care of any variation in the hardness of the water, a control box is placed in the line from the small weir to the wheel meter. This control box is equipped with a double orifice for dividing the water so that only a definite amount of it is delivered to revolve the meter and lower the swiveled take-off pipe to feed chemicals in the proper quantity. A dial is placed at the top of the control box and a pointer on the shaft, which operates the orifice gate, is placed at such a number on the dial as the operating instructions direct for any determination reached by a test of the water. If the water remains constant in character, the control box will not need adjustment. If it changes, the adjustment can be made according to directions on the chart which accompanies the running directions.

Should the relative proportions of temporary and permanent hardness vary greatly and make it necessary to feed the lime and soda-ash separately, or should it be necessary to use anti-foam compound, additional chemical feeding units can be provided and each chemical fed separately in the proportion needed.

The chemical tanks are provided with mechanical agitators which, together with the chemical pump, are actuated by a back-geared electric motor, a small steam, gasoline or oil engine or any other power available. Water treating plants of this type have been installed and are in operation on the New York Central, the Baltimore & Ohio and the Cleveland, Cincinnati, Chicago & St. Louis.

A New Koppel Air-Dump Car

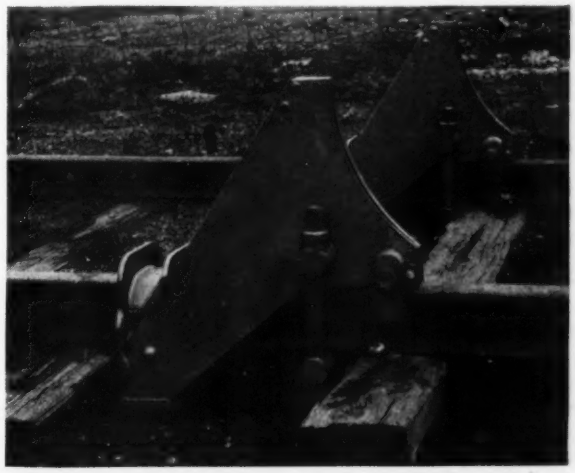
THE KOPPEL Industrial Car and Equipment Company, Koppel, Pa., a subsidiary of the Pressed Steel Car Company, is now introducing an improved design of air-dump car. This is an all-steel, automatic, rolling-trunnion type of car of 100,000-lb., 30-cu. yd. capacity and is known as the Class RTD-30. The car weighs 66,000 lb.; it has a length inside of body at the top of 34 ft. and a width of 9 ft. 3 in. The length inside at the bottom is 32 ft. 4 in., the inside width is 8 ft. 10½ in., and the depth inside the body is 2 ft. 8½ in.

A feature of the design is that the entire weight of the car body and lading is carried in stable equilibrium directly on the center sills without the use of trunnions. This is accomplished by rolling diaphragms built into the bolster construction located centrally on truck centers and by four rolling diaphragms, one located at each cross bearer supporting the air cylinders. The direct bearing surface between the body and underframe members extends 25 in. on either side of the center of the car, and when air is applied in the lifting cylinders the car body rolls from a point 25 in. from the center until the upper stops at the end of the bolsters and diaphragms engage the lower turning seats attached to the underframe. Another feature is an interlocking cast steel stop device just back of each underframe bolster to prevent transverse and longitudinal movement of the body due to rough handling, preventing damage to the piston rods and other parts.

The dumping of the car is controlled by three valves. The indicator valve, which indicates the side on which the car is to be dumped, is set manually by a rod passing across the car, at the ends of which are index plates. This valve can be set to dump on either side or neutral. The operating valve is located at one end of the car, and when opened admits air to the set of cylinders on the side for which the indicator valve is set, dumping the car. The operating valve handle can be locked in a closed position when necessary. The control valve allows the cars to be operated in trains from the operating valve of any car selected in the train. By setting the indicator valve properly any car or cars in the train can be controlled as desired.

The Hayes Wheel Stop

A WHEEL stop which combines the idea of the track skate with the use of one of the ties in the track and the ballast in which it is embedded to absorb the shock of the impact has been placed on the market by the Hayes Track Appliance Company, Richmond, Ind. It commends itself particularly by reason of the simplicity of the design and fact that it may be applied to any rails from four to seven



A Pair of Hayes Type S Wheel Stops in Service

inches high quickly and without drilling any holes or driving any spikes.

The main feature of the device, one of which is provided for each rail, is a wheel-engaging block made of a pair of structural steel plates of irregular outline and assembled in such fashion by rivets and fillers that their forward ends rest on top of the rail, while their rear extremities are separated like the legs of a rider on a horse. The ends of these legs are supported below the bottom of the rail on each side by a yoke-shaped casting that serves both to support the plates and to transmit the force of the blow directly against the side of the tie.

The Koppel Air-Dump Car

The forward end of the block is centered on the ball of the rail by a centering jaw which is capable of adjustment by means of a bolt with a nut on each end. The wheel block is held down on the rail and in an upright position by a loop consisting of two cross shafts and two vertical bolts, one of the cross shafts passing through a hole in the block while the other passes underneath the rail. Holes are provided near the ends of these shafts so that the two bolts may be passed through them as a means of connecting the shafts securely.

In installing the wheel stop the only occasion for any disturbance of the track is to provide a clear space of 20 in. between two of the ties. The installation of the stop entails only the removal and replacement of the loop so that it can be placed around the rail, and the adjustment of the nuts on the centering clamp. The wheel stop is placed on the rail only to secure it in proper position, and at the same time leave it free to slide on the rail except as sliding is resisted by the contact of the tie-engaging bracket on the side of the tie.

The wheel stop, which is designated as the Hayes Type S, is intended for use where some means for stopping cars is required but the cost of a bumping post cannot be justified. Among the advantages to which the manufacturer of this device calls attention are its simplicity, ease of installation, one size fits any rail in ordinary use, there are no rights or lefts, and all parts are interchangeable.

Copperweld Wire Fences

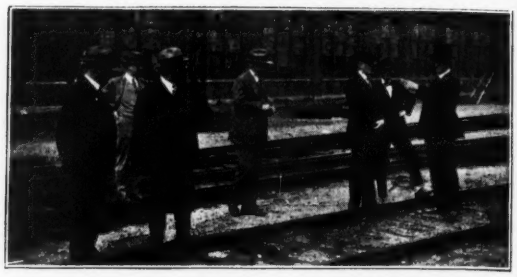
THE Copperweld Steel Company, Glassport, Pa., is using Copperweld steel for fences, which may be furnished in either chain link or ornamental designs, the former for shop grounds and similar locations where durability and protection are the main considerations, and the latter for the grounds around stations and office buildings, where a pleasing appearance is also desired. These types of fence are being distributed through the Page Fence Association, Chicago.

Copperweld fence wire is made by pouring a thick layer of molten ductile copper around a white-hot steel billet, the two metals, in this state, combining in a weld which it is said cannot be destroyed by bending, twisting, hot-rolling, cold-drawing, forging, or sudden changes of temperature. Round billets, 7 in. in diameter by 48 in. long, are ordinarily used, and after having been thoroughly cleansed and fluxed, they are centered in molds, which are then sealed and placed in a furnace where they are heated until the surface of the unoxidized steel reaches the melting point. The molten copper is then poured into the molds, which are of such size that the resulting ingot is nine inches in diameter. This ingot is first hot-rolled into a rod ⅜ in. in diameter, after which it is cold-drawn into wire of the desired size, the original proportions of the copper and steel remaining the same during the various stages of fabrication.

It is said that this wire has an almost indefinite life, on account of its rust-resisting copper surface. If desired for ornamental purposes, the wire may be colored various shades of green or brown by the application of acid.

A LONG TRAIN.—A train of 197 empty cars and 4 loaded cars was hauled on the Virginian from Victoria, Va., to Roanoke, 123 miles, on July 16 by one locomotive in 7 hr. 35 m., including all delays.

With the Associations



Bridge and Building Association

The work of the committees is rapidly being completed. Four of the eight reports of committees are now in the hands of the secretary in their final form and the remaining four are expected at an early date.

The Roadmasters' Association

The program for the September convention is rapidly assuming shape, most of the speakers and other special features now being arranged for. The report of one committee is now completed and in the hands of the secretary, while the other four are promised within a week.

The Wood-Preservers' Association

As noted briefly in the July issue, the Executive committee met at Chattanooga, Tenn., on June 12. This meeting was held in conjunction with the joint summer meeting of the Wood Preservation committee of the A.R.E.A. and the committees of the Wood-Preservers' Association. Approximately 125 members of the two organizations attended the meetings of the respective committees, following which the members inspected the pole treating plants of the Western Union Company at Chattanooga where opportunity was offered to observe the treatment of timber with the new preservative, zinc meta-arsenite.

American Railway Engineering Association

Only two committees met during July, both in Chicago. The Committee on Yards and Terminals held a meeting on July 23 and the Committee on Ballast on July 27. A meeting of the Committee on Economics of Railway Labor is called for August 13 at Chicago. Applications for membership continue to be received in encouraging numbers, approximately 35 having come in during the last month. The proceedings of the March meeting are now coming from the press and it is expected that they will be ready for distribution the first week in August.

The association has accepted an invitation to be represented at a world engineering congress which will be held at Tokio, Japan, in October, 1929, and President Faucette has appointed the following members as a committee to co-operate with the American committee in working out the details: D. J. Brumley (chairman), chief engineer, Chicago Terminal Improvements, I. C., Chicago; G. J. Ray (vice-chairman), chief engineer, D. L. & W., Hoboken, N. J.; J. M. R. Fairbairn, chief engineer, C. P. R., Montreal, Que.; Earl Stimson, chief engineer maintenance, B. & O., Baltimore, Md.; and W. C. Cushing, engineer of standards, Penna., Philadelphia, Pa. In addition, Secretary E. H. Fritch and President Faucette are ex-officio members.

The Material Market

ORDERS FROM the Northern Pacific for 25,000 tons of rails and from the Great Northern for 8,000 tons placed late in July indicate that the season of rail purchases for 1929 operations is opening. It is expected that they will be followed shortly by an order by the Norfolk & Western for about 40,000 tons which will consist largely, if not entirely, of 130-lb section. Part of the Northern Pacific purchase is for immediate delivery for 1928 laying. The Great Northern order was accompanied by an order for 2,000 tons of tie plates, angle bars, spikes and bolts, while the Northern Pacific purchased only 500 tons of track fastenings, indicating that a considerable part of its requirements has not been placed. Earlier in the month, the Pennsylvania placed orders for track accessories totaling 12,000 tons, which, with purchases in smaller lots of other railways, has resulted in considerable activity in this field. Tie plate mills are now operating close to capacity.

Iron and Steel Price Per 100 Lb.

	June		July	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.80	$2.80	$2.80	$2.80
Track bolts	3.80	3.80	3.80	3.80
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.15	2.15	2.15	2.15
Boat spikes	3.00	3.00	3.00	3.00
Plain wire	2.50	$2.50 to 2.55	2.40	2.45
Wire nails, keg	$2.55 to 2.65	2.60 to 2.70	2.55	2.60
Barb wire, galv.	3.35	3.40	3.20	3.25
C. I. pipe, 6 in. to 12 in., ton		40.20 to 41.20		$40.20 to 43.20
Plates	1.85 to 1.90	2.00	$1.85 to 1.90	2.00
Shapes	1.85 to 1.90	2.00	1.85 to 1.90	2.00
Bars, soft steel	1.85 to 1.90	2.00	1.85 to 1.90	2.00
Rivets, struc.	2.90	3.00	2.90	3.00
Con. bars, billet	1.95 to 2.00		1.95 to 2.00	
Con. bars, rail		1.85	1.75	1.85
Rails per gross ton f.o.b. mills	43.00	43.00	43.00	43.00

Track Material Prices Steady

The prices of track materials are steady and have been subject to no adjustment other than the imposing of an extra of 25 cents per 100 lb. on orders for spikes in less than carload lots. Wire and wire products are lower. Recognizing that the prices which they have sought to sustain for the last four months or more have been subject to concessions, the wire mills have officially announced reductions. The new quotation for bright annealed wire at Pittsburgh and Cleveland is 2.40 cents per pound, with 2.55 cents the corresponding base price for wire nails. The new Chicago prices are 2.45 cents and 2.60 cents respectively.

The efforts made by manufacturers to raise the prices of structural steel for third quarter business were with uncertain results in the East but appear to have been successful at Chicago. While the new price of 2.00 cents is generally accepted in the middle west, 1.90 cents, Pittsburgh is weak and some buyers are still able to place orders at 1.85 cents. However, it is evident that the manufacturers are making every effort to establish the higher level for the third quarter, for on July 16, the United States Steel Corporation announced quotations of 2.00 cents, Pittsburgh; 2.10 cents, Chicago; and 2.15 cents, Birmingham for fourth quarter delivery.

Scrap Prices Per Gross Ton at Chicago

	June	July
Relaying rail (including angle bars)	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	14.75 to 15.25	14.75 to 15.25
Rails less than 3 ft. long	15.50 to 16.00	15.25 to 15.75
Frogs and switches cut apart	13.50 to 14.00	13.50 to 14.00
Steel angle bars	14.25 to 14.75	14.25 to 14.75

Cast iron pipe is also higher, the present price for six-inch diameter and larger being two dollars above that quoted last month. The scrap market is weak, but sales are so limited that prices have changed but little, as indicated in the table.

Lumber Market Stronger

A comparison of the total volume of orders received by mills represented in the statistics compiled by the Southern Pine, West Coast and Western Pine associations with the production during the first half of 1928 shows that demand has exceeded output by from 7 to 12 per cent. As a result stocks have been reduced and, as much of the demand is for prompt delivery owing to the prevailing tendency toward hand-to-mouth buying, the position of the buyer is less favorable in the lumber market than it has been for some time. This is particularly apparent in the North Pacific Coast, Douglas fir prices being appreciably higher than a month ago. Some items of southern pine are weak but the general tone is strong.

Southern Pine Mill Prices

	June	July
Flooring, 1x4, B and better, flat	$38.58	$38.82
Board, 1x8, No. 1	35.16	32.68
Dimension, 2x4, 16, No. 1, common	27.73	27.72
Dimension, 2x10, 16, No. 1, common	30.08	29.78
Dimension, 2x4, 16, No. 2, common	22.67	23.72
Dimension, 2x10, 16, No. 2, common	24.12	25.00

Douglas Fir Mill Prices

	June	July
Flooring, 1x4, B and better, flat	$23.75	$24.50
Boards, 1x8, No. 1	15.75	16.50
Dimension, 2x4, 16, No. 1, common	18.25	18.25
Dimension, 2x10, 16, No. 1, common	17.25	18.25
Dimension, 3x3 to 4x12, No. 1, common	19.00	19.75
Dimension, 5x5 to 12x12, No. 1, common rough	16.75	17.75

A somewhat different condition is observed in the Portland cement industry. Stocks at the mills were 19.3 per cent higher at the end of June than a year ago. With mills working 90.1 per cent of capacity during June, the production was 17,469,000 bbl. However, as shipments totaled 18,421,000 bbl. the stocks on hand were reduced by 900,000 bbl. from the total at the end of May. No changes in price are recorded by the distributing centers listed below. The prices given are per barrel in carload lots not including package.

New York	$2.03	Minneapolis	$2.22
Pittsburgh	2.04	Denver	2.85
New Orleans	2.40	Dallas	2.40
Chicago	2.05	San Francisco	2.41
Cincinnati	2.22	Montreal	1.41

Directory of Associations

American Railway Bridge and Building Association—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 23-25, 1928, Hotel Statler, Boston, Mass.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, March 5-7, 1929, Palmer House, Chicago.

American Wood-Preservers' Association, H. L. Dawson, secretary, 228 North La Salle street, Chicago. Next convention, January 22-24, 1929, Louisville, Ky.

Bridge and Building Supply Men's Association.—W. D. Waugh, secretary, Detroit Graphite Company, Railway Exchange Building, St. Louis, Mo. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers—Roy M. Edmonds; secretary, Syndicate Trust Building, St. Louis, Mo. Next convention, April, 1929.

National Railway Appliances Association.—C. W. Kelly, secretary, 1014 South Michigan avenue, Chicago. Annual exhibit during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 18-20, 1928, Book Cadillac Hotel, Detroit, Mich.

Track Supply Association.—A. H. Told, secretary, Positive Rail Anchor Company, Chicago. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

Railway News

Briefly Told

According to the preliminary abstract of statistics of common carriers for the period ending December 31, 1927, made public by the Interstate Commerce Commission, the investment in road and equipment of the operating, lessor and proprietary companies totaled $24,463,367,010, an increase of $592,242,290 over the preceding year.

In spite of an increase of 5 per cent in the number of automobiles in operation in 1927, as compared with the preceding year, there was a decrease of 4 per cent in the number of persons killed as a result of highway crossing accidents. The number of such fatalities in 1927 was 1,974, as compared with 2,064 in 1926. During 1927, there were 23,497 fatalities on the highways involving motor vehicles, as compared with 21,431 in 1926, an increase of 10 per cent.

Revenue freight car loadings for the week ending July 14 amounted to 1,024,534, an increase of 173,929 cars over the preceding week, which contained the July 4 holiday. This total was also an increase of 7,752 cars over the total for the corresponding week in 1927, but a decrease of 51,838 cars as compared with 1926. This brings the total loadings for the 28 weeks of the current year to 26,332,244 as compared with 27,376,607 cars for the same period last year and 27,307,160 in 1926.

The E. H. Harriman memorial medals, granted for conspicuous safety records on American railways, have been awarded for the year 1927. The Union Pacific Railroad was awarded the gold medal and the Duluth & Iron Range received the silver medal, while the bronze medal was awarded to the Trans-Mexican, these roads being first in their respective groups, which are classified according to the locomotive mileage during the year. In the first group honorable mention was accorded the Seaboard Air Line and the Delaware, Lackawanna & Western, while similar action was taken in regard to the Ann Arbor and the New Orleans & North Eastern in the second group.

The Illinois Central has completed negotiations for the lease of air rights to two blocks of land on the south bank of the Chicago river just east of Michigan avenue, Chicago, on which a 75-story building will be erected. The building, which will be occupied by manufacturers and dealers of apparel, will be 845 ft. high, with floor space of 4,650,000 sq. ft., and will cost about $45,000,000. Besides offices, display rooms and other facilities, it is planned to include in the building a 1,000-room hotel to occupy the space between the 47th and 70th floors. The I. C. will retain trackage rights under the building, as well as enough space for an inbound l.c.l. freight station.

The American Short Line Railroad Association has instituted a plan for bringing about an exchange of ideas among its members as a means of improving operating efficiency and solving other problems common to many of the short lines. Bird M. Robinson, president of the association, who recently proposed this plan in a letter which also asked for suggestions, has embodied the replies in a bulletin entitled "Operating Efficiency Ideas." These suggestions include problems relating to maintenance of way, transportation traffic and accounting. The bulletin requests that members send in other suggestions and also that they present their problems through the medium of the bulletins.

Transportation requirements for 29 of the principal commodities for the third quarter of 1928 are estimated as 9,910,768 cars, an increase of about 597,000 cars, or 6.4 per cent over the corresponding period in 1927, according to reports to the Car Service Division of the American Railway Association from the 13 Shippers' Regional Advisory Boards. The principal increases are estimated in automobiles, trucks and parts, 16 per cent; coal and coke, 14 per cent; flour, meal and other mill products, 12 per cent, and petroleum and petroleum products, 10 per cent. The principal commodities in which decreased loadings are estimated are cotton, 28.1 per cent, and cotton seed and products, 41.6 per cent.

The Baltimore & Ohio, the Pennsylvania and the New York, Chicago & St. Louis have petitioned the Interstate Commerce Commission for a reargument and reconsideration of the recent decision which authorized the Pittsburgh & West Virginia to build an extension from Cochran's Mill, Pa., near Pittsburgh, to Connellsville, 38 miles. A connection would be made with the Western Maryland at the latter point and these two roads, together with the Wheeling & Lake, would form a new line between Lake Erie and the Atlantic seaboard. The petition asserts that there is no necessity for the construction of the line and that the capital expenditure could be avoided by the cooperative use of existing lines. It is also requested that the case be decided by the vote of all eleven members of the commission, pointing out that the authorization was made by a vote of five to four.

It cost the taxpayers of the State of New York more than $3.50 a ton for all the freight moved on the New York Barge Canal in 1927, regardless of the length of haul, according to E. E. Loomis, president of the Lehigh Valley and chairman of the Eastern Railways' Committee on Public Relations. Interest charges on the bonds required $6,100,000 in 1927, operating expenses and maintenance took over $3,500,000, while improvements, betterments and miscellaneous expenses swelled the total to more than $10,500,000. Deducting from this total $780,000 received from various sources of income, left about $9,700,000 to be paid by the taxpayers. During 1927, the total amount of freight carried on the canal approximated 2,580,000 tons.

"All the Year—Every Year" is the salient point in the introduction to the latest circular issued by L. G. Bentley, chairman of the Committee on Education of the Safety Section of the American Railway Association. The bulletin directs attention to two items: "locomotive cranes, steam shovels, pile drivers, etc." and "shop machinery, stationary engines, cranes, etc." and quotes statistics which show that the total number of persons killed in 1927 in these two classes was 30, about the same as in preceding years, but that the number of injuries decreased from 4,699 in 1923 to 1,614 in 1927. Mr. Bentley suggests that a copy of the circular be placed in the hands of every operator of a lifting device, with instructions that it be read aloud to all employees who may be in position to be benefited by its contents.

Correction

In the July issue of *Railway Engineering and Maintenance*, page 302, there was published a description of the manner in which the Delaware & Hudson replaced a turntable at Colonie, N. Y., in two and half hours. In this article the statement was made that this table together with two tables installed previously were furnished by the American Bridge Company. This statement was incorrect, for these tables were built by the Bethlehem Steel Company.

Construction News

The Atchison, Topeka & Santa Fe has secured the vacation of certain parts of Poplar and Sixteenth streets in St. Louis, Mo., to provide a site for a freight terminal building, agreeing to turn over to the city a strip of ground for street purposes in lieu of those parts vacated. According to the bill approved by the board of aldermen authorizing these vacations, the railroad must begin construction within two years and must finish construction within five years.

The Baltimore & Ohio has let a contract to the Ferro Construction Company, Chicago, Ill., for erecting superstructures for bridges in connection with track elevation work at Philadelphia, Pa. This project will cost about $26,000. Another contract for excavation and masonry work in connection with the erection of two bridges at Piedmont, Ohio, has been awarded by this road to the Vang Construction Company, Cumberland, Md., at an approximate cost of $52,000.

A contract for the construction of water treating plants at Martinsburg, W. Va., and Miller, was awarded to Frainie Bros. & Haigley, Baltimore, Md. These plants are expected to cost about $30,000.

The Baltimore & Ohio Chicago Terminal has awarded a contract for the sub-structure of a bascule bridge over the relocated channel of the Chicago river at Sixteenth street, Chicago, to the Bates & Rogers Construction Company, Chicago. The contract for the erection of the superstructure has been let to the Mt. Vernon Bridge Company, Mt. Vernon, Ohio. The total cost of the bridge, which will replace the present bridge at Taylor street, will be about $500,000.

The Baltimore & Ohio Chicago Terminal, the Pennsylvania, The Chicago & Western Indiana and **the Wabash** will be required to elevate certain parts of their lines in Chicago, according to an ordinance which has been adopted by the City Council. This ordinance provides for the elevation of four miles of track between Sixty-ninth and Eighty-seventh streets and between South Wood street and Columbus avenue, Chicago. The former line, a north and south right-of-way, about 2.5 miles long, is used by the Baltimore & Ohio Chicago Terminal, the Pennsylvania and the Baltimore & Ohio and street subways will be constructed at Seventy-first, Seventy-third, Seventy-fifth, Seventy-ninth and Eighty-third streets. The latter portion of the elevation will be over a distance of about 1.5 miles on an east and west right-of-way used by the Chicago & Western Indiana, the Belt Railway of Chicago and the Wabash. Subways will be constructed at Oakley boulevard, Columbus avenue and Robey street on this line. The total cost of the project is estimated at $5,000,000. If the ordinance is accepted by the four railroads that are owners of the rights-of-way, it is expected that construction will be undertaken in the Spring of 1929.

The Bangor & Aroostook has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of an automatic electric coaling station at Northern Maine Junction, Maine. The plant will be built in connection with drag scraper equipment which will have storage capacity of 10,000 tons.

The Bessemer & Lake Erie has awarded a contract to the Miller Construction Company, Punxsutawney, Pa., for concrete and excavation work in connection with a subway being built under the main tracks at West Springfield, Pa. The work will cost approximately $34,000.

The Canadian National has awarded a contract to the R. C. Huffman Construction Company, Toronto, Ont., for grading and concrete bridge work in connection with the construction of new passenger station facilities at Hamilton, Ont. A second contract was awarded to the Canadian Dredging Company of Midland, Ont., for suction dredging for land reclamation in connection with new engine facilities which are planned at Charlottetown, P. E. I. The road also plans to construct new baggage and express facilities at St. John, N. B.

A contract has been awarded to the Ryan Construction Company, Vancouver, B. C., for the construction of a 14-story reinforced concrete steel and stone hotel at Vancouver.

The Canadian Pacific has awarded a contract to W. A. Dutton, Winnipeg, Man., for the grading of an extension between Willingdon, Alta., and Strathcona, 70 miles. A contract for the grading of 13 miles of line which will be constructed northwest of Raley, Alta., has been awarded Stewart and Cameron, Winnipeg. This same contractor has been awarded a contract for the grading of an extension of the Lacombe & Northwestern from Breton, Alta., to a point 20 miles northeast.

The Chesapeake & Ohio in connection with the establishment of the Industrial Rayon Corporation plant on the lines of this company near Covington, Va., has found it necessary to construct a spur to the new plant with a bridge across the Jackson river. This bridge will consist of three 100-ft. deck spans and is estimated to cost $80,000. Boxley Brothers Company, Orange, Va., have been awarded the contract for the substructure while a contract for the superstructure has been awarded to the Virginia Bridge and Iron Co., Roanoke, Va.

The Chicago, Rock Island & Pacific company plans the expenditure of $637,000 during the present year for the protection of its line from flood waters. On the Illinois division about $70,000 will be expended at one point to raise the grade 3 ft. in order to obtain additional waterway under a bridge. On the Iowa division $143,270 will be spent to raise the track above flood level at Carnforth, Iowa, Malcom and Tiffin. Track will be raised above the high water mark of the 1927 flood for a distance of 6,000 ft., between Brasfield, Ark., and Biscoe, for a distance of 5,100 ft., between Biscoe, Ark., and De Valls Bluff, and at Kenney, La., at a cost of about $145,700. On the Pan-Handle division rip rap will be placed along the banks of the South Canadian and Red rivers and Deer creek and the track will be raised for short distances at Bridgeport, Tex., and in the vicinity of Deer and Sugar creeks and the Ouachita river at a cost of about $121,000. The raising of track at Winthrop, Mo., McLoud, Okla., and Stuttgart, Kan., the construction of retarders for the prevention of bank erosion at Rushville, Mo., and Tavern Rock and the dredging of a new channel for a stream at Jennings, Kan., will require the expenditure of about $155,000.

A contract has been awarded to the Railroad Water & Coal Handling Company, Chicago, for the construction of 5,000-barrel fuel oil stations at Tucumcari, N. M., and Dalhart, Tex., and for the construction of a fuel oil station with 40,000-gal. storage capacity at Amarillo, Tex. A contract has been let to Joseph E. Nelson & Sons, Chicago, for the construction of fuel oil stations at Herington, Kan., and Pratt. A contract for the construction of a fuel oil station at Liberal, Kan., has been awarded to the F. W. Miller Heating Company, Chicago. A contract has been awarded to Joseph E. Nelson & Sons for the construction of a water treating plant at El Reno, Okla., which will have a capacity of 42,000-gal. per hour and a contract for the construction of a water treating plant with a capacity of 1,000-gal. per minute and a concrete storage sump at Dalhart, has been awarded to the Railroad Water & Coal Handling Company. This same company has been awarded a contract for the construction of a 200-ton automatic electric coaling station at Estherville, Iowa.

The Chicago, Burlington & Quincy has awarded a contract for the construction of a 500,000-bu. grain elevator at Council Bluffs, Iowa, to the Burrell Engineering & Construction Company, Chicago.

The Cleveland Union Terminals is receiving bids for the construction of two adjoining buildings to be known as the Medical Art building and the Garage and Transportation building in connection with its new development at Cleveland, Ohio.

The Detroit, Toledo & Ironton has been authorized by the Interstate Commerce Commission to construct a 9¼-mile line from a connection with its main line at Cairo, Ohio, southward to a connection with its line south of Lima. The new line will provide con-

nections for a new yard which the company will construct. The line authorized is estimated to cost $4,407,000 and the yard $2,746,000.

A contract has been awarded to the Walsh Construction Company, Davenport, Iowa, for about 2,500,000 cu. yd. of grading on its new line between Malinta, Ohio, and Durban, Mich.

The Grand Trunk Western has let a contract for the construction of 9 miles of new double track line between Royal Oak, Mich., and Birmingham, to the Nelson Construction Company, Chicago, at a cost of $587,000.

A contract has been awarded to the Davis-Stuntz Company, Detroit, Mich., for the construction of additions and alterations to the 25-stall enginehouse at Elsdon, (Chicago), Ill.

The Imperial, organized by lumbering and farming interests, has applied to the Interstate Commerce Commission for a certificate authorizing the construction of lines from Mendenhall to Zama, Miss., via Carthage, from Carthage to Canton and Pelahatchie, Miss., and from Carthage to Birmingham, Ala., a total of about 150 miles. The applicant's plan of financing contemplates the sale of stock to lumber and land companies. The application is signed by S. J. Mann, secretary, and M. J. Mann, Decatur, Miss., is counsel.

The Indiana Harbor Belt has awarded a contract for the construction of a large capacity electric cinder plant at Blue Island, Ill., to the Roberts and Schaefer Company, Chicago.

The Kansas City Southern closed bids on July 28 for the construction of a line between Grand View, Mo., and Leeds, 13 miles. Included in the work for which a contract will be let at this time are 350,000 cu. yd. of rock excavation; 529,000 cu. yd. common excavation; 130,000 cu. yd. borrow; 200,000 cu. yd. earth excavation, the laying of 4,700 lin. ft. of drain pipe, the placing of 10,700 cu. yd. of concrete and the erection of 1,200 tons of structural steel.

The Lehigh Valley has awarded a contract to the Barney-Ahlers Construction Corporation, New York, for the construction of a 10-story reinforced concrete warehouse at 144th street and Gerard avenue, New York.

The St. Louis-San Francisco has awarded a contract for the construction of a passenger station at Pensacola, Fla., to the W. Horace Williams Company, New Orleans, La., at a cost of about $100,000.

The Missouri - Kansas - Texas has awarded a contract for the construction of a brick combination freight and passenger station at Dublin, Tex., to J. D. Stephens, Wichita Falls, Tex., at a cost of about $40,000.

The New York Central has awarded a contract to the Edward Joy Company, Syracuse, New York, for steam and water piping for the Central Terminal building at Buffalo; another contract, involving the placing of an embankment between pier "K" and Baldwin avenue, Weehawken, New Jersey, was awarded to O'Brien Brothers, New York, while a third contract for the construction of additional stock yards at West 41st street went to H. H. Sherwin & Company, New York.

A contract for the construction of a three-story passenger station at South Bend, Ind., has been awarded to the Walsh Construction Company, Davenport, Iowa, at a cost of about $500,000. The building will be constructed of reinforced concrete, brick, steel and stone and will have outside dimensions of 85 ft. by 180 ft.

Bids are being received by this company for the construction of a grain elevator at Weehawken, N. J. This road also closed bids on July 17 for work in connection with the elimination of a grade crossing on its Putnam division in Yonkers.

The New York, Chicago & St. Louis has awarded a contract to the McClintic-Marshall Co., Pittsburgh, Pa., for work in connection with the erection of a bridge at Cleveland, O.

The Oregon Short Line has awarded a contract to the Utah Construction Company, Ogden, Utah, for grading in connection with the construction of second main track between Ticeska, Idaho, and King Hill, 10 miles, at a cost of $225,000. The total cost of this project is estimated at $675,000.

The Oregon-Washington Railroad & Navigation Company has let a contract to Morrison & Knudson, Boise, Idaho, for the driving of a tunnel 500 ft. long at Weatherby, Ore.

The Pennsylvania has awarded a contract to W. F. Trimble & Sons Co., Pittsburgh, Pa., for the construction of a freight station, shelter sheds and enclosed waiting rooms together with subways, stairways and platforms at Sewickley, Pa. This project is estimated to cost approximately $230,000. A contract was also awarded to Herman W. Tapp, Fort Wayne, Ind., for the construction of a concrete subway in connection with the elimination of a grade crossing at Anthony boulevard, Fort Wayne. This is expected to cost about $75,000.

Contracts involving approximately $817,000 have recently been awarded by this road. The largest of the group involves an expenditure of approximately $600,000 for work in connection with grade reductions and revisions of line at Adenmoor, Ill., and Griffith. This went to the Mellon Construction Company, Pittsburgh, Pa. A second contract, involving about $120,000, for grading and track work in connection with the construction of the 43rd street subway, Chicago, Ill., was awarded to the S. & M. Contracting Co., Inc., Chicago. Hoeffer & Co., Chicago, received the contract for masonry and street excavation work to cost about $45,000 in connection with this subway construction. A fourth contract for the construction of an overhead bridge on Lake street, Ashtabula, Ohio, was let to the Rust Engineering Company, Pittsburgh, Pa. This is expected to cost approximately $52,000.

The director of highways of Ohio has ordered the preparation of plans for the construction of a highway subway under the tracks of this company on State Route No. 14, three miles northwest of Salem, Ohio.

The Rutland has awarded a contract to the McClintic-Marshall Co., Boston, Mass., for the fabrication and erection of the superstructure of its new bridge over the Winooski river at Burlington, Vt. This work is expected to cost about $85,000.

The Sacramento Northern has awarded a contract for the construction of the Holland branch, which will leave the main line at Riverview, Cal., and will extend about 13 miles south from that point, to Morrison-Knudsen, Boise, Idaho, at a cost of about $800,000.

The Southern Pacific has applied to the Interstate Commerce Commission for authority to construct a line 9.5 miles long between Martinez, Cal., and Goodyear, to be used in lieu of the existing car ferries between Port Costa and Benicia, which it is proposed to abandon. This new line includes a bridge over Carquinez strait referred to in the last issue.

A contract for the reconstruction of the Portland Flour Mills at Portland Ore., for use as a grain elevator with a capacity of about 1,000,000 bu. has been let to the Gilpin Construction Company, Portland, at a cost of approximately $100,000.

This company plans the immediate construction of a line between Klamath Falls, Ore., and Alturas, Cal., 97 miles, to connect the Cascade route of its San Francisco-Portland line with the Nevada-California-Oregon. The new line will extend southeasterly from Klamath Falls to Merrill, Ore., across Tule Lake, which has been drained, through Cornell, Cal., and easterly to Alturas. It will provide access to an agricultural territory south of Klamath Falls in the Klamath Basin and a large stand of virgin pine timber in the same vicinity.

The Standard Lumber Mills will construct a logging railroad from Snowflake, Ariz., to a point 11 miles distant. Connection will be made with the Apache railway at Snowflake.

The Terminal Railroad Association of St. Louis has awarded the general contract for the enlargement and improvement of the St. Louis (Mo.) Union station and its facilities at a cost of about $4,000,000 to Dwight P. Robinson & Co., New York. The Association and the city have reached a tentative agreement for the vacation of Twentieth street, south of Market street, in return for the dedication to public use of a similar strip of land

and the contribution of $150,000 toward the cost of constructing a viaduct to carry Clark avenue over the new station train sheds. This agreement, when formally signed by the city and the Association, will answer the earlier refusal of the Board of Public Service to grant a permit for this construction. A permit has been granted by the city for the construction of an $850,000 express warehouse and office building, which will have a four-story wing with outside dimensions of 220 ft. by 70 ft. and a two-story wing with outside dimensions of 700 ft. by 70 ft.

The Texas & Pacific will bear 50 per cent of the cost of the construction of a viaduct over its tracks at Cregg street, Big Spring, Tex. The balance of the total cost of $130,000 will be divided between the city and the county.

The Toronto Terminals has awarded a contract to P. Lyall & Sons Construction Company, Montreal, Que., for the construction of a four-story express and office building for the use of the express department of the Canadian National at Toronto, Ont. Outside dimensions of this building will be 696 ft. by 55 ft.

The Union Pacific has awarded the general contract for the construction of a 12-story addition to its general office building at Omaha, Neb., to John Lof & Son, Omaha. A general contract for engine terminal facilities at Gering, Neb., has been awarded to Thomas J. Allen, Scotts Bluff, Neb.

The Wabash has awarded a contract for the construction of a one-story brick and concrete passenger and freight station at Huntington, Ind., to the Walsh Construction Company, Chicago.

A general contract for the construction of a fruit exchange building at Second and Carr streets, St. Louis, Mo., has been let to the Boaz-Kiel Construction Company, St. Louis, Mo. The total cost is estimate at $850,000.

The Western Pacific has incorporated the Western Pacific California Railroad Company, a wholly owned subsidiary with a capital of $15,000,000, to build 174 miles of railroad in California, at an approximate cost of $13,500,000. Plans provide for a 25-mile line from San Francisco to Redwood City, eventually to be connected with the main line of the Western Pacific at Niles, giving direct all-rail access to San Francisco and serving an important industrial area. This line will cost $3,700,000. A 138-mile extension will be built from Nile Garden, south of Stockton on the main line, to Kings River, south of Fresno, which is estimated to cost $8,500,000 with the ultimate projection of the line to Bakersfield; also a 7½-mile extension of the Holland branch of the Sacramento Northern, now under construction, to Ryde in the Sacramento River delta area; also a 3½-mile branch from Brack, on the main line north of Stockton.

Supply Trade News

General

The Pittsburgh Testing Laboratory has opened an office in Boston, Mass., at 101 Tremont street, in charge of **Donald L. Macdonald**, who was formerly connected with the engineering department of Stone & Webster.

Personal

R. C. Phillips, secretary of the American Rolling Mill Company, Middletown, Ohio, died on July 11 in that city, at the age of 63 years.

G. T. Van Schaick, president of the Universal Supply Company, Chicago, died on July 8, from injuries received in an automobile accident near Eagle River, Wis.

Kenneth M. Bailey has been appointed technical sales representative of the Curtin-Howe Corporation, New York, with headquarters at 515 N. O. Bank Building, New Orleans, La.

George J. Lynch, assistant district manager of the Chicago Pneumatic Tool Company, New York, has been promoted to district sales manager, with headquarters at St. Louis, Mo.

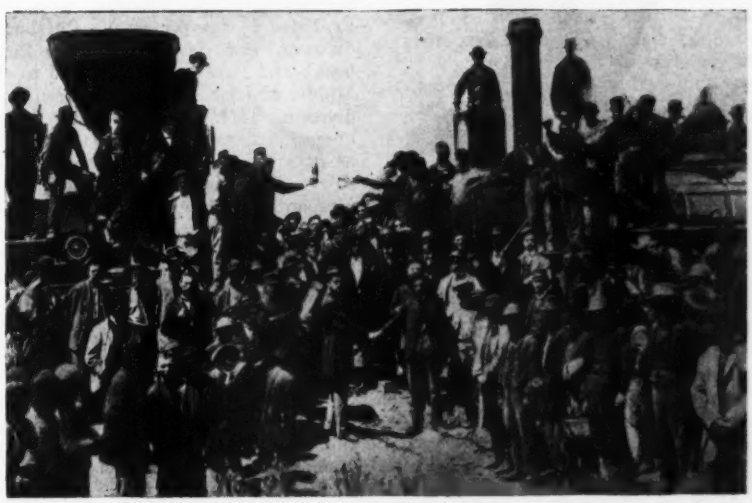
F. L. Stone, assistant general sales manager of the Universal Portland Cement Company, has been promoted to general sales manager with headquarters at Chicago, to succeed **Blaine S. Smith**, who has resigned to become president of the Pennsylvania-Dixie Cement Corporation, as noted in the July issue, and **A. C. Cronkrite**, division sales manager, with headquarters at Chicago, has been promoted to assistant general sales manager, to succeed Mr. Stone. **Earle D. McKay**, field engineer for the service bureau at Minneapolis, Minn., has been promoted to division sales manager at Duluth, Minn., succeeding **W. L. Greenly**, who has been transferred to the Chicago district. **Edward Quebbeman**, division sales manager for Illinois and Missouri, has been promoted to Western sales manager, with headquarters at Chicago, and **Harry A. Craig**, representative at Detroit, Mich., has been promoted to sales manager for Illinois and Missouri, to succeed Mr. Quebbeman.

Mr. Stone was born at Camden, Ark., and was educated at the University of the South and at the United States Naval Academy. He entered the employ of the Universal Portland Cement Company, 18 years ago, as a salesman, and later served successively as chief clerk, assistant general sales agent and division sales manager until his promotion to assistant general sales manager, which position he was holding at the time of his recent promotion to general sales manager with headquarters at Chicago.

R. R. Schweitzer has been appointed vice-president and general manager of the Layne-Southeastern Company, with headquarters in the S. A. L. building, Norfolk, Va., to succeed **W. H. Reeves**, with headquarters at St. Petersburg, Fla., who is now associated with Layne & Bowler, Inc., Memphis, Tenn., in the Chicago office. The St. Petersburg office was discontinued on June 15 and the Florida office is under the charge of **Y. C. Carmichael**, at 4711 French street, Jacksonville, Fla.

Lewis Thomas, sales representative of The Q and C Company, New York, with headquarters at Chicago, has been promoted to district sales manager with headquarters in the same city, and **L. E. Hassman** has been appointed district sales manager, with headquarters at St. Louis, Mo.

Mr. Thomas was educated at Lehigh University and entered railway work with the Pennsylvania on relocation and double track work. He later served as resident engineer on the construction of



Builders of the Central Pacific and Union Pacific Shaking Hands at the Joining of Rails, Promontory, Utah, May 10, 1869

industrial plants, following which he was engaged in the contracting business in the Northwest for five years. Mr. Thomas was a senior civil engineer in the Bureau of Valuation of the Interstate Commerce Commission for four years, resigning in 1920 to become a sales representative of The Q and C Company, which position he was holding at the time of his recent promotion to district sales manager.

Lewis Thomas

Mr. Hassman was educated in the Friends Central School, Philadelphia, Pa., and entered the service of the Illinois Central as a machinist apprentice. He served successively as a machinist and draftsman at Chicago, roundhouse foreman at Carbondale, Ill., and general foreman at East St. Louis and in February, 1906, was promoted to master mechanic at Clinton, Ill. In February, 1912, he left railway service to join the railroad sales department of the Johns-Manville Company, with headquarters at New Orleans, La. In February, 1917, he was appointed southwestern representative of Brown & Co., Inc., St. Louis, where he remained until that firm retired from business in 1924, when he entered the service of the Ulster Iron Works, as southwestern representative, with headquarters in the same city, which position he held until his recent appointment as district sales manager of The Q and C Company with headquarters at St. Louis.

L. E. Hassman

Personal Mention

General

H. T. Frushour, division engineer of the Cleveland division of the Pennsylvania with headquarters at Cleveland, Ohio, has been promoted to superintendent of the Monongahela division, with headquarters at Pittsburgh, Pa.

Norman B. Pitcairn, superintendent of the New York division of the Pennsylvania, with headquarters at Jersey City, N. J., whose railway experience embraces service in both the engineering and maintenance of way departments, has been promoted to general superintendent of the Eastern Ohio division, with headquarters at Pittsburgh, Pa. Mr. Pitcairn was born on November 8, 1881, at Harrisburg, Pa., and was educated at Princeton University. He entered railway service on June 29, 1901, as a rodman in the office of the chief engineer of the Pennsylvania and was successively transitman, assistant supervisor and supervisor. On November 10, 1919, he was promoted to division engineer of the Pittsburgh division, with headquarters at Pittsburgh and later was transferred to the Middle division and to the New York division. Mr. Pitcairn entered the operating department in October, 1923, as superintendent of the Norfolk division with headquarters at Cape Charles, Va., and was later transferred to the Middle division at Altoona and the New York division at Jersey City. He was serving at the latter point at the time of his recent promotion to general superintendent of the Eastern Ohio division.

Norman B. Pitcairn

R. K. Rochester, general manager of the Long Island, with headquarters at New York, and an engineer by education and experience, has been appointed general manager of the Eastern region of the Pennsylvania, with headquarters at Philadelphia, Pa. Mr. Rochester was born on December 7, 1877, at Simcoe, Ont., and was educated at Rose Polytechnic Institute. He entered railway service on November 10, 1901, as assistant engineer maintenance of way of the Michigan division of the Vandalia (now a part of the Pennsylvania) and on May 1, 1902, was promoted to acting engineer maintenance of way of the same division, this being followed in November of the same year by his appointment as engineer maintenance of way of that division. On June 1, 1905, he was promoted to principal assistant engineer of the Vandalia, and on May 1, 1909, he was made division engineer of the St. Louis division. Mr. Rochester entered the operating department on July 1, 1913, as superintendent of the Peoria division and was transferred successively to the Logansport division of the Pittsburgh, Cincinnati, Chicago & St. Louis (now a part of the Pennsylvania) and the Cleveland and Pittsburgh division of the Pennsylvania. He was in military service from February 11, 1918, to January 16, 1919, when he returned to the Pennsylvania as superintendent on special duty in the office of the general manager of the Western lines. On August 16, 1919, he was promoted to general superintendent of the Central Ohio division and later was transferred to the Buffalo division and the New Jersey division. He was promoted to assistant general manager of the Eastern region in June, 1927, and in November of the same year was appointed general manager of the Long Island, which position he was holding at the time of his promotion to general manager of the Eastern region of the Pennsylvania.

Engineering

J. G. Wolfe has been appointed division engineer on the Kansas City, Mexico and Orient, with headquarters at San Angelo, Tex.

G. C. Beaumont, formerly in the engineering department of the Los Angeles & Salt Lake, has been appointed terminal engineer of the Harbor Belt Line, with headquarters at Los Angeles, Cal.

J. H. Wesley, chemist on the Missouri Pacific, with headquarters at Kansas City, Kan., has been promoted to engineer of water service, with headquarters at St. Louis, Mo., to succeed **H. H. Richardson,** who has resigned to become a representative of the Aluminate Sales Corporation, with headquarters, at Chicago.

J. B. Dawson, assistant division engineer of the Coast division of the Southern Pacific, with headquarters at San Francisco, Cal., has been promoted to division engineer of the New Mexico division, with headquarters at El Paso, Tex., where he succeeds **H. E. Stansbury,** who has been transferred to the Rio Grande division with headquarters at the same point, to take the place of **F. L. Guy,** who in turn, has been transferred to the Coast division with headquarters at San Francisco, to succeed

E. C. Morrison, who has been assigned to other duties.

W. B. Hodge, division engineer of the Springfield division and the Indianapolis terminal of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Indianapolis, Ind., has been appointed division engineer of the Chicago division, with headquarters in the same city, to succeed **J. W. Burt,** who has been transferred to the Springfield division and Indianapolis terminal.

Karl M. Hammann, who for the past year has been assigned to special duties in the maintenance of way department of the Long Island, with headquarters at Jamaica, N. Y., has been promoted to assistant engineer maintenance of way, with the same headquarters. Mr. Hammann, who was born on September 29, 1883, at Easton, Pa., received his

Karl M. Hammann

primary education in the Easton public schools, and his higher education at Lafayette College, which he attended from 1901 to 1903, inclusive. In 1903, he entered railroad service in the engineering department of the Lehigh Valley, and remained with this road until November 14, 1906, when he became a transitman on the Long Island at Jamaica. On July 15, 1907, he was appointed chief draftsman, and on August 1, 1912, was made supervisor at Hicksville, N. Y. On December 1, 1916, he was transferred to Jamaica, and on July 1, 1927, was assigned to special duties in the office of the engineer maintenance of way, which position he held until July 10, 1928, when his promotion to assistant engineer maintenance of way became effective.

J. F. Pinson, division engineer of the Coast division of the Chicago, Milwaukee, St. Paul & Pacific with headquarters at Tacoma, Wash., has been promoted to the newly created position of assistant engineer maintenance of way of the lines west of Mobridge, S. D., with headquarters at Seattle, Wash., and **R. H. Smith,** division engineer of the Trans-Missouri division, with headquarters at Mobridge, has been transferred to Tacoma, to succeed Mr. Pinson on the Coast division. **C. J. Swane,** division engineer of the Musselshell division, with headquarters at Miles City, Mont., has been transferred to the Northern Montana division, with headquarters at Lewiston, Mont., succeeding **W. E. Ring** who has been transferred to Miles City, where he will have jurisdiction over both the Musselshell and the Trans-Missouri divisions.

D. P. Beach, division engineer on the Pennsylvania, with headquarters at Indianapolis, Ind., has been promoted to acting engineer maintenance of way of the Central Pennsylvania division, with headquarters at Williamsport, Pa., to succeed **Elmer Irving,** who has been granted a leave of absence on account of illness. **G. H. Schlotterer,** supervisor on the Eastern division, with headquarters at Conway, Pa., has been promoted to division engineer, with headquarters at Indianapolis to succeed Mr. Beach. **A. H. Tasker,** supervisor of telegraph and signals in the Central region, with headquarters at Pittsburgh, Pa., has been promoted to division engineer of the Conemaugh division, with headquarters in the same city. **F. L. Scott,** draftsman on the Buffalo division, has been promoted to assistant to the division engineer of the Erie and Ashtabula division, with headquarters at New Castle, Pa.

Robert C. Falconer, engineering assistant vice-president on the Erie, with headquarters at New York, has been appointed assistant vice-president and chief engineer to succeed, in the latter capacity, **Robert S. Parsons,** notice of whose death was published in the June issue. Mr. Falconer was born on March 21, 1874, at St. Marys, Pa., and was educated at the University of Wisconsin, where he graduated in 1895. He entered railway service in December, 1898, as a transitman on the Pennsylvania and later served as a resident engineer. He was out of railway service from May, 1901, to October, 1905, when he became an assistant engineer in the construction department of the Erie. In October, 1911, he was promoted to division engineer of the New York division, and a year later was again promoted to principal assistant engineer. In February 1913, Mr. Falconer was made superintendent of construction and in January, 1916, he was advanced to assistant chief engineer. He was promoted to assistant to the president, and chief engineer in July, 1918, serving in that capacity until February, 1927, when he was appointed engineering assistant vice-president, which position he was holding at the time of his recent appointment as assistant vice-president and chief engineer.

Robert C. Falconer

Track

Thomas Kinney, supervisor on the New York Central, with headquarters at Jersey Shore, Pa., retired on June 1, after a service of 47 years with that company.

Martin Bootjer, yard foreman on the Chicago, Rock Island & Pacific, at Silvis, Ill., who has been an extra gang foreman during the summer months, has been promoted to roadmaster, with headquarters at Manly, Iowa, where he has jurisdiction over the line from Marble Rock, Iowa, to Minneapolis, Minn. Mr. Bootjer succeeds **C. H. Gruver,** who has retired on account of the age limit.

John Branley, division roadmaster on the Great Northern, with headquarters at Minneapolis, Minn., whose retirement on a pension was noted in the May issue, was born on May 16, 1858, at Ballygar, Ireland, and entered railway service in 1880, as a section laborer at Jersey City, N. J. He entered the employ of the Great Northern in May, 1888, as a section laborer at St. Cloud, Minn., and was later promoted to section foreman at Cass Lake. In 1896, he was promoted to assistant roadmaster, with headquarters at St. Cloud, and in 1905 was promoted to division roadmaster, which position he was holding at the time of his retirement.

Raymond Westcott, whose promotion to supervisor on the Reading, with headquarters at Olney, Philadelphia, Pa., was announced in the July issue, was born at Dennisville, N. J., on April 18, 1898. He entered railway service with the Reading on May 23, 1917, as a rodman in the construction department, and at the same time continued his higher education through evening courses at Drexel Institute, which work extended from 1916 through 1920. In April, 1918, he was made a levelman in the same department, and in March, 1920, was promoted to transitman. In February, 1923, he was promoted to assistant supervisor at Harrisburg, Pa., and later was transferred to Reading, Pa., and then to Philadelphia. In December, 1926, he was made acting supervisor, and held this position, and that of assistant supervisor, until June 11, 1928, having served in the meantime at both Philadelphia and Olney. On this latter date he was promoted to the position of supervisor.

Patrick Woods, whose appointment as roadmaster on the Canadian National, with headquarters at Radville, Sask., was noted in the June issue, was born at Newry, County Down, Ireland,

on June 14, 1875, and entered railway service on August 16, 1901, as a section laborer on the Canadian Northern (now a part of the Canadian National) at Roosevelt, Minn., later being promoted to relief foreman. He was promoted to section foreman at Sprague, Man., on October 8, 1905, and was transferred successively to Williams, Minn., and Graceton. In 1918, Mr. Woods was elected general chairman of the Maintenance of Way Employees' Committee of the Canadian Northern, and devoted his time to the duties of that office. After the formation of the Canadian National System, he was elected general chairman of the Maintenance of Way Employees' Committee of the Western lines, and in 1923, when the committees of the Eastern and Western lines were consolidated, he was elected general chairman of the committee for the entire system, except the Eastern lines of the Grand Trunk. Mr. Woods resigned from this position in March of the present year, and on May 1 was appointed roadmaster on the Canadian National.

Bridge and Building

A. L. McCloy has been appointed supervisor of bridges and buildings on the Pere Marquette, with headquarters at Saginaw, Mich., to succeed **J. D. Black,** deceased.

J. V. Duchac has been appointed acting supervisor of bridges and buildings on the Chicago & North Western, with headquarters at Antigo, Wis., to take the place of **T. H. Durfree,** who was injured in a motor car accident.

Purchasing and Stores

C. H. Drayton has been appointed division storekeeper on the Michigan Central, with headquarters at West Detroit, Mich., succeeding **F. V. Tenkonohy,** resigned.

C. E. Walsh purchasing agent on the Pennsylvania with headquarters at Philadelphia, Pa., has been appointed also purchasing agent of the Long Island with the same headquarters, to succeed **George Kefer,** with headquarters at New York, who has been appointed assistant purchasing agent, with the same headquarters. **C. B. Hall,** stores manager on the Pennsylvania, with headquarters at Philadelphia, has been appointed also to the same position on the Long Island, with the same headquarters.

Obituary

Hezekiah Bissell, fomerly chief engineer of the Boston & Maine, died at Pasadena, Cal., on June 24. Mr. Bissell was born on February 7, 1835, and graduated from Sheffield Scientific School at Yale University in 1861. After serving in the Civil War, he entered railway service in 1864 with the Union Pacific on construction, where he became a resident engineer. In 1869, he became a division engineer on the Adirondack (now a part of the Delaware & Hudson), and later was promoted to chief engineer. He left that road in 1872 to become a division engineer on the Puno-Cuzco in Peru and returned to this country in 1874, when he became a resident engineer on the Cleveland, Cincinnati, Chicago & St. Louis. In the following year, Mr. Bissell entered the service of the Eastern Railroad (now a part of the Boston & Maine) and in 1888 was advanced to the position of chief engineer of the Boston & Maine, which position he was holding at the time of his retirement in 1909.

Elmer J. Remensnyder, assistant purchasing agent on the Pennsylvania, headquarters at Philadelphia, Pa., died in that city on June 27.

Paul B. Binns, assistant supervisor on the New York Central, with headquarters at Hillsdale, Mich., died on April 9, following an illness of about five weeks.

Abner Taylor Young, vice-president, treasurer, general manager and chief engineer of the San Luis Central, with headquarters at Denver, Colo., died at St. Luke's hospital in that city on June 28.

Edwin Britton Katte, chief engineer of electric traction of the New York Central, with headquarters at New York, died at his home in Irvington-on-Hudson on July 19. Mr. Katte was born on October 16, 1871, at St. Louis, Mo., and was educated at Cornell University, where he graduated in 1893. He entered railway service on January 1, 1896, as an assistant engineer on the New York Central, in charge of the erection of the Park Avenue viaduct in New York. In 1918, he entered the drafting department of the chief engineer's office and later became assistant engineer in charge of water supply. This was followed later in the same year by his promotion to mechanical engineer in the engineering department, in which capacity he had charge of the design and construction of heating, lighting and power plants, coaling stations and water supply. In December, 1903, he was promoted to electrical engineer, which position carried with it the secretaryship of the electric traction commission, which had charge of the electrical and mechanical engineering corps engaged in the electrification of the New York terminals. Mr. Katte was promoted to chief engineer of electric traction on November 1, 1906.

Garret Davis, formerly assistant chief engineer of the Burlington, Cedar Rapids & Northern (now a part of the Chicago, Rock Island & Pacific) and later a superintendent on the Rock Island, died at Calgary, Alta., on July 16. Mr. Davis was born on August 19, 1855, in Scott County, Ky., and entered railway service in 1874, in the construction department of the Southern Pacific. In 1877, he entered the employ of the B. C. R. & N., and in the following year was promoted to roadmaster. He was promoted to division engineer in 1894, and in 1900 was further promoted to assistant chief engineer, with headquarters at Cedar Rapids, Iowa. When that road was taken over by the Rock Island in 1902, Mr. Davis was appointed district engineer, with the same headquarters, entering the operating department in 1907 as superintendent, with headquarters at the same point. In 1914, he was appointed division engineer, with headquarters at El Reno, Okla., and from 1916 to 1920, he was engaged in various capacities on valuation surveys and construction work. In the latter year, Mr. Davis was appointed division engineer, with headquarters at Cedar Rapids, which position he was holding at the time of his retirement from active service in 1925.

John H. Reagan, superintendent of track on the Grand Trunk Western, with headquarters at Detroit, Mich., died at his home in Battle Creek, Mich., on July 16, after an illness of two months. Mr. Reagan's railway service embraced a period of 60 years, 31 of which were with the Grand Trunk Western and its predecessor company. He was born at Dunville, Pa., on May 4, 1855, and entered railway service on

John H. Reagan

July 1, 1868, as a water boy on the Reading at Gerard, Pa., becoming a section laborer on the same road at Catawissa, Pa., on August 1 of the following year. On May 1, 1874, just before he was 19 years old, he was made a section foreman on the Delaware, Lackawanna & Western at Nanticoke, Pa., and on March 25, 1878, he entered the employ of the Wabash at Moberly, Mo., where he served as a section foreman and extra gang foreman. On September 1, 1887, he was promoted to roadmaster at Moberly, and on July 1, 1893, was appointed a roadmaster on the Chicago & Alton, with headquarters at Springfield, Ill. On July 1, 1897, he was appointed general roadmaster of the lines of the Grank Trunk system in the United States (now the Grand Trunk Western) with headquarters at Battle Creek, Mich. On February 15, 1913, his title was changed to superintendent of track.

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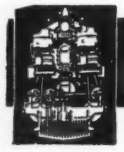

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Push Car Bearings
Timken Roller Bearing Co.

Rail Anchors
Bethlehem Steel Co.
Lundie Engineering Corp.
Verona Tool Works
Woodings Forge & Tool Co.

Rail Anti-Creepers
See Anti-Creepers, Rail

Rail Benders
American Chain Co., Inc.
Buda Co.
Q. & C. Co.
Verona Tool Works

Rail Bonds
Verona Tool Works

Rail Braces
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr., & Co., Wm.

Rail Expanders
Ramapo Ajax Corp.

Rail Joints
See Joints, Rail

Rail Saws, Portable
Industrial Brownhoist Corp.
Kalamazoo Railway Supply Co.
Q. & C. Co.

Rail Springs
Verona Tool Works

Rails, Girder
Bethlehem Steel Co.

Rails, Tee
Bethlehem Steel Co.
Carnegie Steel Co.

Regulators, Oxy-Acetylene
Oxweld Railroad Service Co.

Replacers, Car & Locomotive
American Chain Co., Inc.
Buda Co.
Q. & C. Co.

Retaining Walls, Precast
Federal Cement Tile Co.
Massey Concrete Product Corp.

Rivets
Bethlehem Steel Co.

Rock Hammers
Ingersoll-Rand Company

Rods, Welding
Oxweld Railroad Service Co.

Roof Slabs
Federal Cement Tile Co.
Massey Concrete Products Corp.

Roofing, Cement & Concrete Tile
Federal Cement Tile Co.

Roofing Composition
Lehon Co.

Rules
Lufkin Rule Co.

Rust Preventive
Dearborn Chemical Co.

Saw Rigs
American Saw Mill Machinery Co.

Saws, High Speed Friction
American Saw Mill Machinery Co.

Saw Mills
American Saw Mill Machinery Co.

Scales, Tape
Lufkin Rule Co.

Scoops
Ames Shovel & Tool Co.

Screw Spikes
Illinois Steel Company

Screw Spike Drivers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Section Cars
See Cars, Section

Sharpeners, Rock Drill Steel
Ingersoll-Rand Co.

Sheathing Paper
Lehon Co.

Sheet Iron
Armco Culvert Mfrs. Assn.

Shingles, Composition
Lehon Co.

Shovels
Ames Shovel & Tool Co.
Verona Tool Works
Woodings Forge & Tool Co.

Shovels, Steam
American Hoist & Derrick Co.
Northwest Engineering Co.

Signal Foundations, Concrete
Massey Concrete Products Corp.

Skid Excavators & Dredges
Northwest Engineering Co.

Skid Shoes
Q. & C. Co.

Slabs, Concrete
Massey Concrete Products Corp.

Smoke Stacks
Massey Concrete Products Corp.

Snow Melting Device
Lundie Engineering Corp.
Q. & C. Co.

Snow Plows
Jordan Co., O. F.
Q. & C. Co.

Spades
Ames Shovel & Tool Co.

Spikes
Bethlehem Steel Co.
Illinois Steel Company

Spreader Cars
See Cars, Spreader

Spreaders, Ballast
See Ballast Spreaders

Stands, Switch & Target
Bethlehem Steel Co.
Q. & C. Co.
Ramapo Ajax Corp.

Steel, Alloy
Central Alloy Steel Corp.
Illinois Steel Company

Steel Cross Ties
Carnegie Steel Co.

Steel, Electric Furnace
Timken Roller Bearing Co.

Steel, Open Hearth
Timken Roller Bearing Co.

Steel Plates and Shapes
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Steel, Special Analysis
Timken Roller Bearing Co.

Step Joints
See Joints, Step.

Structural Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Switch Guard
Ramapo Ajax Corp.

Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switchmen's Houses
Massey Concrete Products Corp.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tags, Aluminum
Niagara Metal Stamping Co.

Tampers, Tie
See Tie Tampers

Tapes, Measuring
Lufkin Rule Co.

Tee Rails
See Rails, Tee.

Telegraph Poles
See Poles

Telegraph Service, Long Distance
American Telephone & Tele-Co.

Telephone Service, Long Distance
American Telephone & Telegraph Co.

Testing of Materials
Hunt Co., Robert W.

Thawing Outfits
Lundie Engineering Corp.
Q. & C. Co.

Ties
Jennison-Wright Co.

Tie Plate Clamps
Q. & C. Co.

Tie Plates
Bethlehem Steel Co.
Illinois Steel Co.
Lundie Engineering Corp.
Sellers Manufacturing Co.

Tie Rods
Bethlehem Steel Co.

Tie Scorer
Woolery Machine Co.

Tie Tampers
Chicago Pneumatic Tool Co.
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Syntron Co.

Tile, Roofing
Federal Cement Tile Co.

Timber
Southern Cypress Mfrs. Ass'n.

Timber, Creosoted
Jennison-Wright Co.

Tools, Drainage
Ames Shovel & Tool Co.

Tools, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Tools, Pneumatic
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Tools, Track
Ames Shovel & Tool Co.
Buda Co.
Verona Tool Works
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Track Braces
See Braces, Track

Track Drills
See Drills, Track

Track Gages
Buda Co.
Kalamazoo Railway Supply Co.

Track Insulation
Q. & C. Co.

Track Jacks
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Track Levels
Kalamazoo Railway Supply Co.

Track Liners
See Liners, Track

Track, Special Work
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

Track Tools
See Tools, Track

Trestle Slabs
Massey Concrete Products Corp.

Trucks, Hand, Steel
Anchor Post Fence Co.

Tubing, Seamless Steel
Timken Roller Bearing Co.

Ventilators
Q. & C. Co.

Water Treating Plants
Dearborn Chemical Co.

Waterproofing Fabrics
Lehon Co.

Weed Burner
Fairmont Railway Motors, Inc.
Woolery Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.
Q. & C. Co.

Welding & Cutting Equipment
Electric Railweld Service Corp.
Oxweld Railroad Service Co.

Welding, Electric
Electric Railweld Service Corp.

Welding, Oxy-Acetylene
Oxweld Railroad Service Co.

Wheels, Hand & Motor Car
Buda Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Woolery Machine Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Wire Fencing
American Steel & Wire Co.
Anchor Post Fence Co.
Cyclone Fence Co.
Page Fence Association

Wood Preservation
See Preservation, Timber

Wood Working Machinery
American Saw Mill Machinery Co.

ALPHABETICAL INDEX TO ADVERTISERS

LEADERSHIP

Claims of leadership can be made, and often are made, without sufficient proof to justify them.

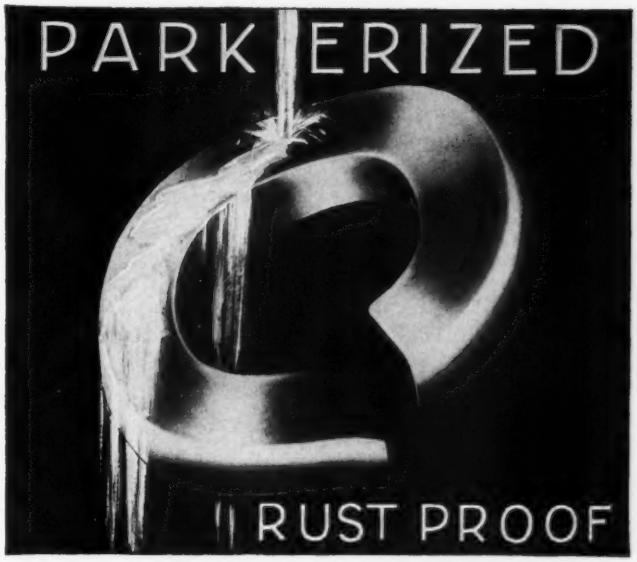
We believe that the following three facts are substantial evidence of real leadership.

First: The majority of the railroads of this country have adopted Improved Hipower.

Second: Most of the roads that try them use more each year.

Third: The number of roads using Improved Hipower is steadily increasing.

This leadership is due to the many points of Improved Hipower superiority which we are taking up one by one in our advertisements this year.



There are Many Points of Improved Hipower Superiority. This is point of superiority No. 6.

RUST-PROOF

RUST and corrosion cannot affect IMPROVED HIPOWER. Drenched by rain or brine drippings, buried under snow, exposed to dampness in all climates it will not rust or corrode.

In addition to all other distinctive advantages of IMPROVED HIPOWER it is thoroughly weather-proofed.

Every known process of rust-proofing was tried and the Parker process was adopted because it not only met the rigid requirements of weather-proofing but it also left the physical properties of the metal absolutely unaffected.

This is another example of the established policy of our engineering and research department to make for railroads the highest quality spring washer that experience and skill can produce.

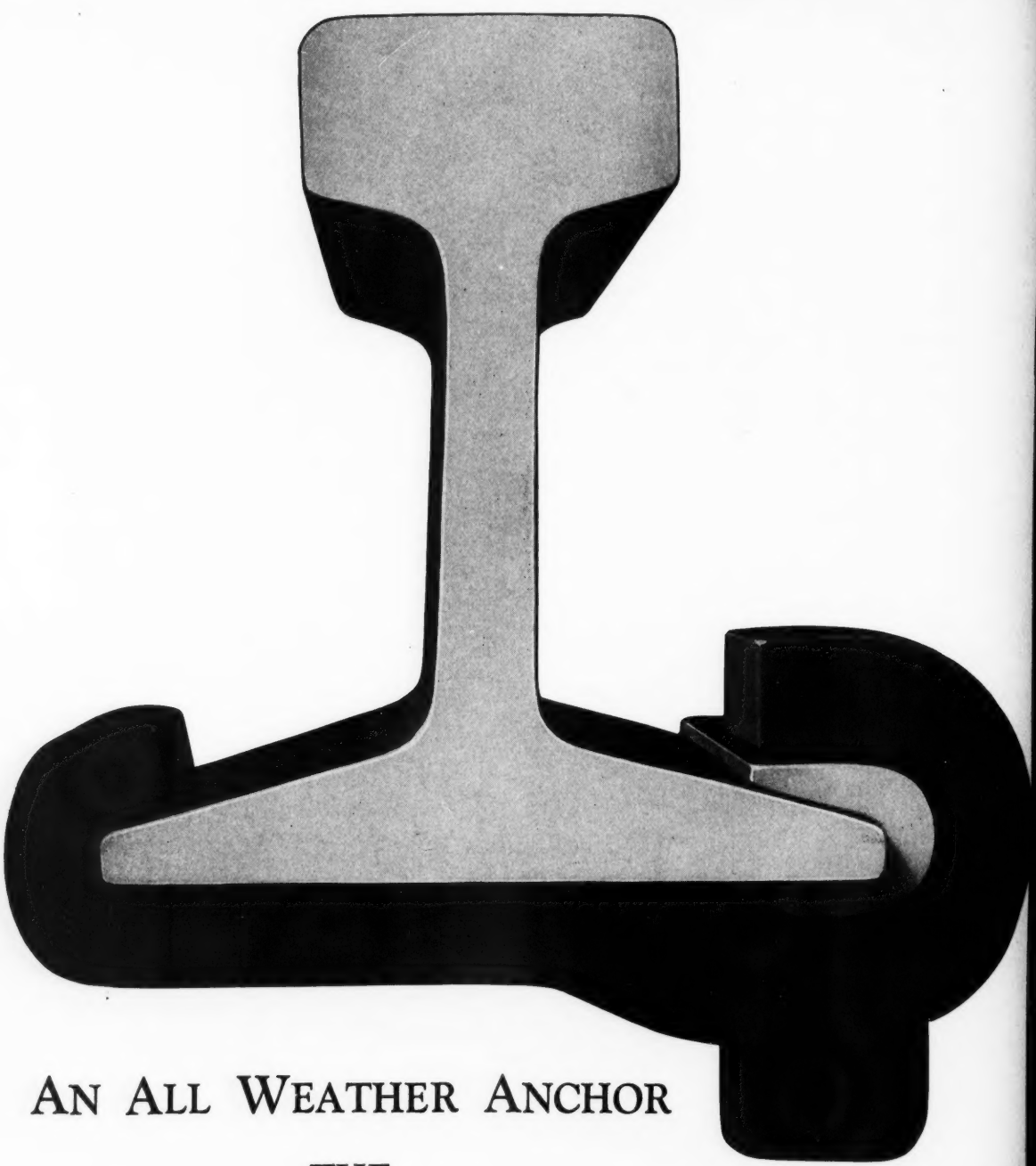
And it costs 90% less per 1000 lbs. pressure than plain coil spring washers.

There are many other points of superiority. Our advertisements will announce them.

THE NATIONAL LOCK WASHER COMPANY
Newark, New Jersey, U. S. A.

IMPROVED HIPOWER

Commercially Non-flattenable - - Permanently Rust-Proof



AN ALL WEATHER ANCHOR

THE ERICSON RAIL ANCHOR

Works just as efficiently in winter as in summer. Years of service in Northern United States and Canada have proven its worth in extreme climatic changes.

APPLY ERICSONS NOW—JUDGE RESULTS THIS WINTER

VERONA TOOL WORKS PITTSBURGH